

**Jozef Beňačka**  
**Jozef Haring**  
**Elena Haringová**  
**Eva Ďurinová**  
**Ingrid Zámbojová**

*Original scientific paper*

*Institute of Physiotherapy, Balneology and  
Medical Rehabilitation University of SSt. Cyril and Methodius in Trnava*

## **SELECTED SOMATIC INDEXES OF THE UNDERGRADUATES**

### **INTRODUCTION**

Somatic indexes inform us about the outer visual image of the posture, about its dimensions and shape. In many research papers the correlation between image of the posture and health level of the human being is accentuated. The image and functionality of the human body represent basic factors of somatic and psychic states and manifestation of the personality in behaviour (Fialova, 2001). In the research at the IFBLR we decided to evaluate some attributes of somatic characteristics of the students in order to find out the extent of differentiation from the other students at universities throughout Slovakia.

### **MATERIALS AND METHODS**

This research included 87 students of IFBLR UCM Trnava, of which 32 were male and 55 female. The research group consisted of full-time students. We divided the group into trained and untrained men and women. The average age was 21 years. The measurements were taken between 18<sup>th</sup> November and 16<sup>th</sup> December 2009 at IFBLR Piešťany.

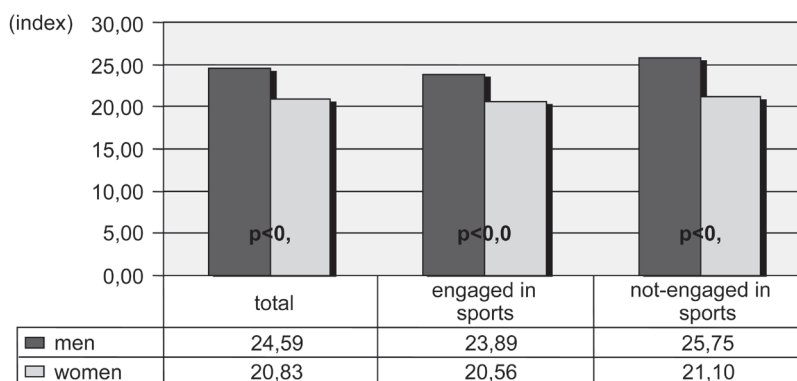
This published part of the research was aimed at evaluating selected somatic indexes of the students at IFBLR UCM involving body height and weight (and body mass index calculated from them), waist - hip ratio, percentage of the fat and some indexes relating to the students' posture. The body weight was measured with OMRON BF 400 and the body fat was examined with OMRON BF-306. The body posture was evaluated using Jaros and Lomnicka method. The results present average values of the measured parameters, and some of the relevant values were statistically analysed using t-test or chi-square.

## RESULTS AND DISCUSSION

### Body mass index (BMI)

In the whole group of subjects at IFBLR only normal values were present (index between 18.5. and 24.9). The average values of our students were 22.71. For men the index was much higher ranging to 24.59 while for women it was much lower (20.83). This difference was statistically significant (Figure 1).

The difference between trained men and women was smaller though still within the normal range of weight and again it reached higher values in men (23.9) compared to women (20.56). The hypothesis is that men are heavier than women due to greater proportion of muscles. Among untrained students, men reached higher value of the body mass index compared to other groups (25.75), which indicates slight overweight. In this group there is also the biggest difference in BMI between men and women (4.56), which is statistically significant. The higher value in the group of untrained men can be deduced as being the result of lower energetic output. The comparison of our BMI values and values from other universities did not differ much (Židek 2009, Cepkova 2009, Bobřík 2007). According to the data from IFBLR and in comparison with other universities, the evaluated students had their BMI within normal range.



*Figure 1. Body mass index (BMI)*

### Waist-hip ratio /Index WHR/

At present, WHR represents cardiovascular disease risk factor among adults and children as well. The higher the value is, the higher the risk of developing cardiovascular disease. Higher risk of disease in men is over 1.0 and in women over 0.8. In the whole group of the students at IFBLR we found that the average value of WHR was 0.842. In men, the value was within normal range and thus without the

risk of developing cardiovascular diseases (0.878), the index in women was within the range of mild risk to borderline of higher risk of cardiovascular disease (0.807). The difference was statistically significant (Figure 2).

In the group of trained students the WHR were slightly lower in men and women, for both genders they were within no risk of cardiovascular disease (in women tight). The difference between men and women was statistically significant. In the group of untrained students, while comparing the previous groups, we found higher WHR values both in men and women. In men, the values were within no risk range (0.894) while in women the values were within higher risk of cardiovascular diseases (0.813). The difference between men and women was statistically significant. There were no major differences between our students and students from other universities in WHR.

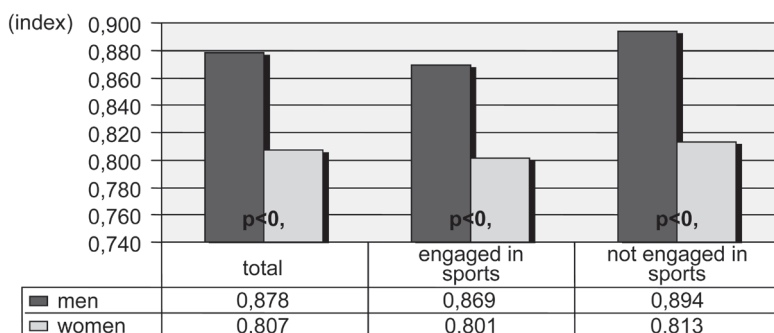
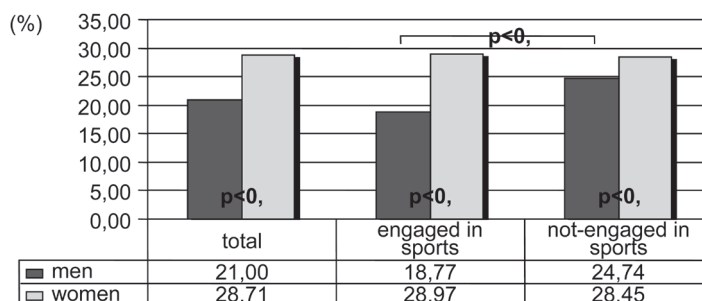


Figure 2. Waist-hip ratio /Index WHR/

### The body fat percentage

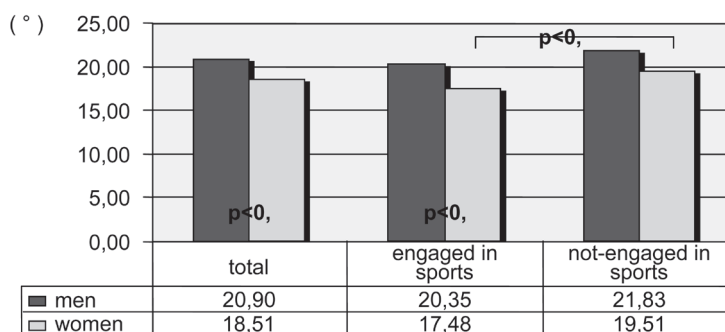
The whole group of students had the average 24.85% of fat. In women the percentage was much higher (28.71%, in men much lower (21%) (Figure 3). The difference is statistically significant. Much higher difference was found among trained men and women. The men had 18.77% of fat and were within normal values; the women had 29.98% and were over the high percentage. This difference is also statistically significant. It would be interesting to find out which sport has higher influence on body fat. Among untrained men and women there was no big difference. It appears that their values were approximate. Men had 24.74% of the fat and were at the borderline between high and very high percentage, the women had 28.45% of fat and they were at the borderline between normal and high percentage. Evaluating the results it appeared that there was higher percentage of fat in our students comparing the students of other universities. This is not true, because the measurements on other schools were done using other methods (calculation, calliper, Omron older age).



**Figure 3.** The body fat percentage

### Posture of the head and neck

In the whole group of subjects at IFBLR we found that the angle of the head posture was 19.70 in average. While in men the value was 20.90 degrees, in women it was 18.51 degrees. The difference between genders was 2.39 degree and was statistically significant. The difference between trained men and women was 2.87 degree and was statistically significant. According to this, the men had larger curve of cervical lordosis in average compared to women. There was also statistically significant difference in the angle between head and neck in trained and untrained students, thus the untrained men had larger cervical lordosis than women.



**Figure 4.** Posture of the head and neck

### The posture of the shoulders

In the whole group we found that average value of the shoulder angle was 7.42 degrees. The angle was 8.06 degrees in men and 6.79 degrees in women. Also in the group of trained subjects there were slightly higher values in men (7.9 degrees) than in women (6.59 degrees). Similar results were within the group of untrained students

but the difference between men and women was wider - 8.33 degrees in men and 6.98 degrees in women. Overall, the values of the average deviation of the shoulders in the whole group were really small as well as the differences between men and women and trained and untrained, suggesting that the students do not have incorrect body posture. It is a question to what extent the students were influenced by the knowledge acquired during their classes in anatomy, physiotherapy, exercise etc. We suggest that it was positive and thus they tried intentionally to push the shoulders backward (Figure 5).

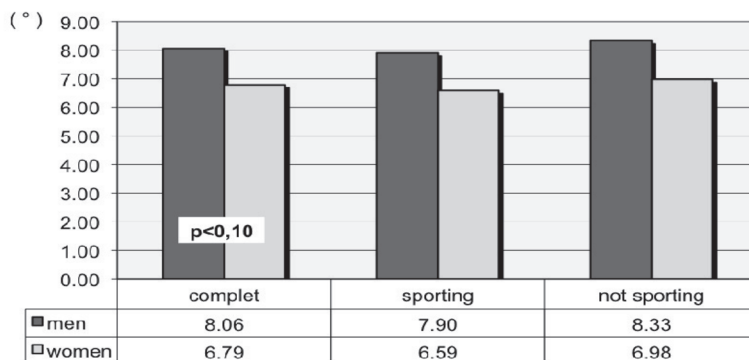


Figure 5. The posture of the shoulders

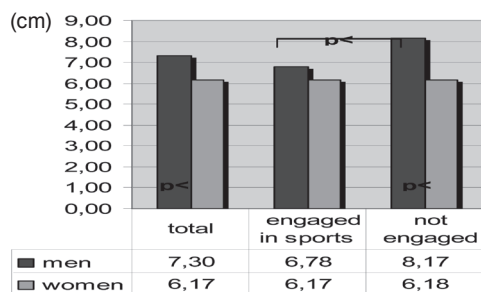
### The spine shape in sagittal plane

a) The arc of cervical spine

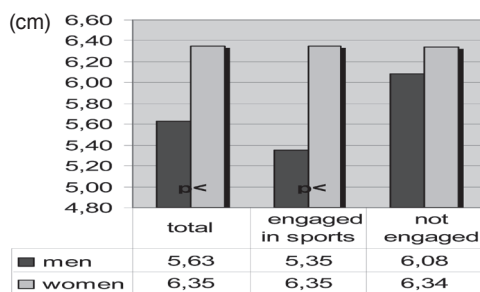
In our group of subjects we found the average value of the curve in cervical spine was 6.73 cm and there were no major differences between men (7.3 cm) and women (6.17 cm). Even smaller differences were presented in the values of the curve for trained males (6.78 cm) and females (6.17 cm). Only the group of untrained students had major differences in cervical arc between men (8.17 cm) and women (6.18 cm). Thus, in the untrained group the arc was 2cm larger. This difference is statistically significant (Figure 6). Statistically significant is also the difference between trained and untrained subjects favouring the trained (with lower curve).

b) The arc in lumbar part

In the whole group we found the average value was 6 cm in the lumbar arc and there were no remarkable differences between men and women (0.78 cm). Similarly, there were small differences between trained men and women and minor differences between untrained men and women (Figure 7).



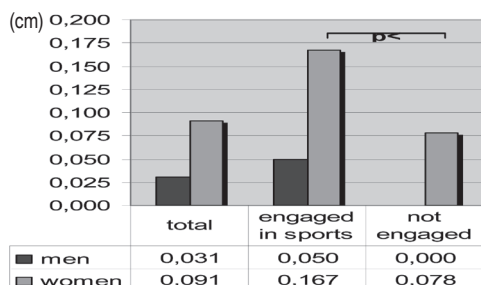
a) **Figure 6.** The arc of cervical spine



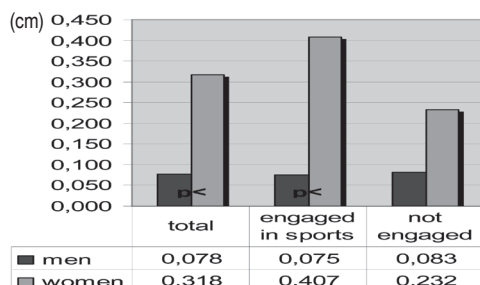
b) **Figure 7.** The arc in lumbar part

### The spine shape in frontal plane

In the whole group the average value of deviation to the right was 0.061 cm and to the left 0.198 cm. The deviation to both sides was neglectable and the values to the right and left were most identical. Even the differences between men and women did not reach significance level (Figure 8 and 9). After all it can be deduced that the spine posture in frontal plane was very good.



**Figure 8.** The spine shape in frontal plane (spine to the right)



**Figure 9.** The spine shape in frontal plane (spine to the left)

### The height of the shoulders

In the whole group of the students of IFBLR the average value of the height of the right shoulder was 142.9 cm and left 143.4 cm (almost identical). The differences between left and right shoulder among men was 0.5 cm and in women 1.5 cm favouring the left shoulder (the right was lower). The difference between men and women in the whole group was statistically significant. Similarly, there was significance in the height of the left shoulder. The differences between trained men and women were

not significant. While the difference of the shoulder height in men was 0.4 cm, in women it was surprisingly higher – 2.5 cm. It was confirmed that the right shoulder was lower. This corresponds with the results of several researches about the level of the left and right shoulder in women. The differences in the shoulder height in untrained men and women were 0.6 cm in men and 0.5 in women. These differences are not significant.

## REFERENCES

1. Cepková, A., 2009 – Hodnotenie stavu telesného rozvoja, telesnej zdatnosti, držania tela študentov STU. In.: Telesná výchova, šport, výskum na univerzitách. s. 59-63 Bratislava : STU v Bratislave, 2009. 80-227-3210-9.
2. Fialová, L., 2001 – Body image jako součást sebepojetí člověka. Praha: Univerzita Karlova v Prahe, 2001. ISBN 80-246-0173-7. 269 s.
3. Jaroš, M., Lomníček, M., 1957 – Návrh zjednodušeného hodnocení postavy žáků všeobecně vzdělávací školy. In.: Těl. Vých. Mlád., 1957, 23 s. 194-203.
4. Koláriková, A., 2006 – Zmeny tvaru a statiky chrbtice v rôznych variantoch stoja a ich diagnostika polohovým snímačom. In.: Pohyb a zdravie – 3. ročník. Trenčín: Trenčianska univerzita A. Dubčeka v Trenčíne, 2006, s. 91-98. 170 s. ISBN 80–8075-138-2.
5. Zvonář, M., 2009 – Involuce motorické výkonnosti dospělé populace. In: Telesná výchova, šport, výskum na univerzitách (CD ROM). Bratislava: STU, 2009, s. 24-30.

## ABSTRACT

In this article the authors are focused on evaluation of the selected somatic indexes of the students of the Institute of Physiotherapy, Balneology and Medical Rehabilitation (IFBLR) UCM in Trnava. The level of indexes was measured on 87 full-time students among which 32 were men and 55 women, with 47 trained and 40 untrained students overall. The average age was 21 years. The authors evaluate the results not only of the whole group, but separately for trained and untrained students and also for men and women. The results were compared with the results available from other universities in Slovakia. The research showed that average BMI values (22.71) place the students in the normal weight category; the values for men were much higher than for women. Similar results were obtained for trained and untrained men and women. The average WHR values for men can be set as „without risk“(0.878), for women with mild risk of cardiovascular disease (0.807). The average percentage of the fat in the whole group (24.85%) was influenced by the high values for women (almost

28.71%) in comparison to the men (21.0%). Even higher difference was found between trained men (18.77%) and trained women (28.97%). The values of certain components of the body posture were collected, but their levels were insufficient for descriptive and percent evaluation due to unavailable rating scales in adults. The results will be helpful for further research aiming to evaluate body posture in the future.

**Key words:** *somatic indexes of the students, body mass index, waist-hip ratio, fat percentage, body posture, students of Physiotherapy*