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# **ANALYSIS OF THE DIFERENCE BETWEEN THE SUBJECTIVE LOAD INTENSITY PERCEPTION AND REAL HEART RATE OF MALE AND FEMALE PLAYERS IN HANDBALL TRAINING**

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## **SUMMARY**

Heart rate is the most frequently used sign for intensity of the load in physical activity. One of the alternative forms to determine the intensity is subjective evaluation of an athlete. Subjective evaluation of the intensity of the load can influence the effectiveness of the training process. The presented study deals with the use of Borg scale (CR-10) in adolescents in training handball. The research was conducted in a group of 32 female handball players in the three training sessions. It was performed as subjective evaluation of intensity loads and also as monitoring heart rate using heart rate monitors Team Polar2. The results showed that the median dependence ( $r = .63$ ) between the subjectively perceived fatigue and actual heart rate. This dependence has occurred in the subjective assessment of the intensity of the load in boys ( $r = .47$ ), but the girls demonstrated much closer dependence ( $r = .71$ ). The boys showed the tendency to overrate while girls underrate the intensity of the load.

**KEYWORDS:** Borg scale, intensity of the load, handball, monitoring heart rate, training session, the perception of fatigue

## **INTRODUCTION**

Functional variables such as heart rate, oxygen consumption, ventilation are frequently measured parameters in sport to determine physical fitness of an athlete or to identify internal response of the organism to the applied load. The functional variables indicate the response of the organism to physical load which is also reflected in human consciousness. Čechovská and Dobrý (2008) reported that relying only on the physiological measures could lead to an



overload or overtraining, which is also confirmed in works of Coutts, Rampinini, Marcora, Castagna and Impellizzeri (2009) and Little and Williams (2007). Monitoring and perception of the amount of the physical load in the training process is one of the important aspects in the sports preparation of athletes. Perceived stress is influenced by physiological, psychological (such as hypnotic suggestion, the expected duration of the load, the expected level of performance, social influence, motivation, emotional state, style of intensity modulation stimuli, cognitive style) and other factors (environment, gender, age, smoking and medication) (Borg, 1998; Eston & Connolly, 1996; Haskvitz et al., 1992; Noble, & Robertson, 1996; Sidney et al., 1993; Navlas, & Marisi, 1996; Watt, & Grove, 1993). Other factors include the signals from the working muscles and joints, hormone secretion, etc. (Watt et al., 1993, Mocková, 2000).

Psychological factors contribute to the perception of physical exertion with about 33%, mostly in low and medium intensity (Morgan, 1973; Noble, & Robertson, 1996). In high intensity physiological stimuli prevails which are meant to create a stronger signal for the physiological sensations (Morgan, 1973; Noble, & Robertson, 1996). The psychological factors that contribute to the perception of physical fatigue are, for instance, hypnotic suggestion, estimated load, the expected level of performance, social influence, motivation, emotional state, style of intensity modulation stimuli, cognitive style, and other factors (Borg, 1998; Noble, & Robertson, 1996).

Already in 1985, Carton and Rhodes were considering anaerobic threshold (ANP) a certain level of perceived load. The primary stimulus to perceive the intensity of the load during the low intensity levels was considered a physiological perception from the muscles. They argued that if the intensity exceeds a threshold ANP, increased blood lactate interacts with the message from the neuromuscular system. Perception of the anaerobic threshold (ANP) also interacts with central stimuli (heart rate, VO<sub>2</sub>) (Carton & Rhodes, 1985). Peripheral stimuli (blood lactate, concentrations of adenosine triphosphate, creatine phosphokinase, and glycogen) prevail in most cases, but also distinctly central stimuli can affect the perception of the stress. Carton and Rhodes (1985) also considered the possibility of influencing the perception of exertion by training, which was determined at higher levels of exertion.

Physical fatigue is produced naturally during physical activities and decrease during recovery. The early stages of physical activities the fatigue is evident from, for instance, loss of coordination. In sports training it is important for the coach to verify the perception of physical exertion of his athletes. There is a high correlation between the subjective perception

of the physical load and the actual heart rate during physical activity. The athlete is able to have a good estimate of the actual heart rate during physical activity (Borg, 1998 in Sellers 2007).

The subjective evaluation of physical exertion (stress level) during exercise utilizes Borg scale (RPE - Rating of Perceived Exertion) or CR-10 (Category Ratio Scale). Hampson et al. (2001), respectively. Muyor (2013) considers the Borg RPE scale and CR-10 valid and reliable. Both scales were verified according to objective indicators (heart rate, oxygen consumption, blood lactate and size of minute ventilation) of loading intensity (Borg et al., 1985; Noble et al. 1983; Chen, Fan & Moe, 2002; Buckley, Easton, & Sim, 2000; Day, McGuigan, Brice, & Foster, 2004; Robertson, Goss, Dubé, Rutkowski, Dupain, Brennan, & Andreacci, 2004; Muyor, 2013). The scale of CR10, has, according to Scott Black, Quinn, and Coutts (2013), a high correlation with both internal load (banisters TRIMP (training impetus) and Edwards TRIMP (training impetus)) ( $r = 0.83$ ), and with external loads (covered distance, speed motion) ( $r = 0.81$  and  $0.71$ ) and by Impellizzeri, et al. (2004) the high correlation is also with heart rate ( $r = 0.50$  and  $r = 0.85$ ,  $p < 0.01$ ). CR-10 is a ten-point scale. CR-10 scale is a standardized and suitable method for evaluation and estimation of perceived physical exertion during exercise, training and rehabilitation. The range of CR-10 is considered a global indicator of exercise intensity, including the physiological indicators (e.g. oxygen consumption, heart rate, beta endorphin, glucose etc.) and psychological factors (Morgan, 1994). Sellers (2007) divided the range of CR-10 into two parts: "Endurance training zone" (endurance training zone and aerobic zone), which includes a range of 1-4 degrees and the "strength training zone" (force training zone), which includes a range of 5 to 10 degrees. Borg scale CR-10 (Borg, 1998) was used in the research dealing with, among other things, the evaluation of the physiological load of athletes in small game exercises in sport games such as football (Casamichana & Castellano, 2010; Impellizzeri, et al., 2004; Ngo et al. 2012 Sjökvist et al., 2011 Rampinini et al., 2004) and other publications aimed at the intensity level during exercise in sport (Day et al., 2004; Gros Lambert, Bendit, Grange & Rouillon, 2005; Ueda, T., & Kurokawa, 1995; Zamuner et al. 2011). Coutts, Rampinini, Marcora, Castagna, & Impellizzeri (2009) in their study, they recommended to use a modified Borg scale CR-10 also in training of sports games, and at high intensity interval training, where the validity of the scale as an indicator of training intensity was confirmed.

Pfeiffer, Pivarnik, Womack, Reeves and Malina (2002) found that the range of CR-10 is a reliable and valid to measure adolescent girls, and according to their opinion, this scale shows to be more reliable and valid than the RPE scale in the same age population.

According to several authors (Bar-Or, 1977; Bar-Or, Ward, 1989; Lamb, 1955), is this scale suitable for children (8-12 years), who in the use of RPE scale have greater tendency to underestimate the intensity of exercise and their cognitive abilities are lower. Bar-Or (1977) also suggests that children younger than 16 years are less competent in the use of RPE scale than adults (18+ years) and therefore recommends the scale of CR-10, which was derived from developmentally appropriate verbal skills of children and simple numerical scale (Eston et al, 1994; Williams et al., 1994). Compared to RPE scale, the CR-10 scale has five less responses and shorter "meaningful" scale (1-10) (Williams et al., 1991).

## AIM

The main objective of this study was to analyse the subjective perception of the intensity of loads of players using the Borg CR-10 scale in training handball. Partial aims of the study was to determine the difference between the actual heart rate and subjective perception of physical stress in handball game exercises and determine the differences of perception of physical exertion in player of both sex.

## METHODOLOGY

The research group

The first research group (n = 16) was the junior category players DHK Zora Olomouc (Table 1), the second research group (n = 16) consisted of junior handball TJ Cement Borders (Table 2).

Goalkeepers are not included in the study sample, because of the specificity of their game. Olomouc handball players play the top competition, where they play for the title the annually. Some of them have international experience from abroad matches. The monitored team had five training units in a week.

Table 1. Functional and anthropometric characteristics of the players DHK Zora Olomouc (n = 16)

	Age	Height (cm)	Weight (kg)	BMI (kg/m <sup>2</sup> )	HR <sub>max</sub> (beats/min)
Mean	18,3 ± 0,6	168,7 ± 7,5	62,8 ± 8,6	22,0 ± 1,9	198 ± 6,8

The second monitored group was a group of junior handball players TJ Cement Hranice. Further specification of subjects can be found in Table 2. The goalkeepers were not evaluated because of the specificity of their game. The older adolescent players are playing the second

league of the youth and their annual goal is to advance into top competition. Younger adolescents play the first league, the highest competition in their category. The teams practise 3 times a week and have no previous experience with measuring the intensity of the load.

Table 2. Functional and anthropometric characteristics of the players TJ Cement Border (n = 16)

	Age	Height (cm)	Weight (kg)	BMI (kg/m <sup>2</sup> )	HR <sub>max</sub> (beats/min)
Mean	16,4 ± 1,1	179,6 ± 5	72,4 ± 4,2	22,5 ± 0,8	197 ± 2,1

### Research Methods

Data for the subjective evaluation of the perception of the intensity of load were obtained by using the Borg scale (CR-10), so that players rated their physical load immediately after every preparatory and game practices and preparatory game using the Borg scale CR -10. Czech version of the CR-10 scale was introduced earlier by Macková in 1992, and a slightly different translation introduced Herynková in 1996. This research used Mackova's version (1992).

Scale	Description of exertion	% Hrmax
1	no exertion at all	60 - 70 %
2	extremely light exertion	70 - 75 %
3	very light exertion	70 - 75 %
4	light exertion	75 - 80 %
5	somewhat hard exertion	80 - 90 %
6	hard exertion	80 - 90 %
7	very hard exertion	90 - 94 %
8	extremely hard exertion	95 - 100 %
9	maximal exertion	95 - 100 %
10	exhaustion	

Figure1. Borg scale (CR-10) sails Štejfá and Siegel (1999).

Each player filled the evaluation sheet separately, regardless of others.

Values indicating internal load of the players were measured by monitoring heart rate (HR) during the methodological-organizational forms using a heart rate monitor Team Polar

(Polar Electro, Kempele, Finland). Determining factor in the assessment of the average intensity of the load during the methodological-organizational forms was the parameter of mean heart rate. The electrodes of the chest strap recorded data in five-second intervals. The recorded data were saved to a computer and were analysed and evaluated by the software (SW Polar Precision Performance software).

Players performed shuttle run 20 meters, "Multistage Fitness Test" (Leger & Lambert, 1982) to determine the maximum heart rate, which was carried out in a gym within the training sessions that preceded the research itself.

#### Data Collection

Research in both measured groups took place in the main competition season (March-April 2011). Each group was measured at three handball training units. Each training unit contained different methodological and organizational forms (MOF). Girls and boys have the same content of the training units (same exercises, number of repetitions, duration of load and rest). The warm-up in both groups was also identical, it lasted twenty minutes (five minutes light run, ten minutes of stretching and five minutes running drills with the ball). The research was preceded by an informative meeting with individual coaches and players who were informed how to fill record sheets i.e. players crossed their physical load in every preparatory and game exercises and preparatory play in the prepared record sheet on a scale of 1-10 immediately after the workout or game. The players practised filling in forms in three exercises during a session and use heart rate monitors, to be ready for the measurement. The girls already worked with heart rate monitors. In three training sessions, the players recorded their physical load in the twenty-training exercises, ten game exercises and six preparatory games. Each subject was assigned to a record sheet for evaluating subjective physical exertion and each was also assigned to monitor heart rate (heart rate monitor). All training units were recorded by a camera Panasonic SRD - H80 for more accurate evaluation of heart rate monitoring, the video verified the exact time of exercises measurement. Immediately after the end of the measured methodical-organizational forms players filled in the sheet for subjective feeling of exertion on the Borg scale.

To process the data from the heart rate monitors, we used the Polar software "Precision Performance SW" curve showing the recorded heart rate depending on the time of the training unit.

The Borg scale (CR-10) corresponds to a zone loading intensity and heart rate. Average heart rate of players which were drawn from the methodological - organizational forms is recalculated individually into Borg points (Figure 1).

#### Statistic data

Statistical evaluation was performed in Statistica 7.0 (StatSoft Inc., Tulsa, OK, USA). For further processing, we used non-parametric methods of statistical inference. To determine the relationship between subjective values (CR-10) and measured values (SF), we used the Spearman correlation coefficient. Statistical significance was assessed at the level of significance of variables at a value of 0.05.

## RESULTS AND DISCUSSION

#### Comparison of subjective evaluation of physical exertion and actual effort in players

We compared all the data from all the exercise in all subjects, regardless of gender. During the six training units, we obtained 357 measurements of average values of heart rate (HR), which were compared with the values obtained by evaluation of the perception of physical exertion (CR-10) (Table 3). Analysis of dependence between both groups data ( $r = .63$ ), we found median dependence of the obtained data. Table 3 shows that players overestimated intensity level by one level. We believe that the quality of the evaluation is the perception of body exertion in handball training affected by frequent changes in intensity. Further inaccuracies may result from a lack of concentration on the perception of sensations reflecting load. This concentration can disturb the requirement for precision of movements (i.e the need to focus on good execution of an exercise) and to some extent the players may be disrupted by the game environment, where are frequent changes to which the individual must adequately respond.

In a study of Foster et al. (2001) the CR-10 players showed less than the actual average heart rate (players underestimated themselves) the similar results also found Sampaio, Abrantes, & Leite (2009) in their study of a modified game of basketball. Foster et al. (2001) also states that it may be due to the multifactorial nature of Borg scale, which includes both physiological and psychological factors.

It has been previously demonstrated that there is a higher muscular tension during extensive load and that requires an increase of motor units which have a higher circulation rate (Gearhart., Et al. 2001, Noble & Robertson, 1996). With the increase of motor units,

the motor cortex sends stronger signals to the sensory cortex, which may increase the perceived exertion (Gearhart et al, 2002).

Table 3. The average values of CR-10 and the heart rate in all measured exercises.

n	Estimated CR-10	Estimated HR <sub>1</sub> (beats/min)	Estimated average %HR <sub>max1</sub> (%)	Actual CR-10	HR <sub>2</sub> HR <sub>2</sub> (beats/min)	Average %HR <sub>max2</sub> (%)
357	5,2	160,4	81	4,5	153,1	77,5

*Legend: CR-10 - perception of load measured by exercise; HR<sub>1</sub> - estimated heart rate measured during exercise; HR<sub>2</sub> - the actual average heart rate measured during exercise; %HR<sub>max1</sub> - The intensity of the estimated average heart rate measured during exercise; %HR<sub>max2</sub> - The intensity of the actual average heart rate measured during exercise*

#### Comparison of the results by gender

The aim was to determine the influence of the gender on the evaluation of the intensity of the load. We obtained 179 measurements of average heart rate in boys and 177 in girls. Table 4 shows that boys significantly overestimated the intensity of the load during a training session. On average, it was overestimated by three levels. These data also show only median relationship between perceived and measured exertion of boys ( $r = .47$ ), we found medium dependence of the data obtained. We believe that this may be due to competitiveness and aspiration level, which is generally considered higher among boys (Sharma, Bhanot, & Paswan, 2005; Walter & Marzolf, 1951). This may indicate shyness and fear of possible ridiculing in the group.

Table 4. Average values of CR-10 and heart rate measured in all exercises for boys.

n	Estimated CR-10	Estimated HR <sub>1</sub> (beats/min)	Estimated average %HR <sub>max1</sub> (%)	Actual CR-10	HR <sub>2</sub> (beats/min)	Average %HR <sub>max2</sub> (%)
179	6,4	166,3	84	3,6	144	73,1

*Legend: CR-10 - perception of load measured by exercise; HR<sub>1</sub> - estimated heart rate measured during exercise; HR<sub>2</sub> - the actual average heart rate measured during exercise; %HR<sub>max1</sub> - The intensity of the estimated average heart rate measured during exercise; %HR<sub>max2</sub> - The intensity of the actual average heart rate measured during exercise*

Table 5 shows that girls during a training session slightly underestimated their fatigue. The difference in the arithmetic average between actual and estimated fatigue was unlike

boys, only in one level. Girls are therefore more accurate in estimating perception of fatigue than boys, which is confirmed by a much closer relationship between the data obtained ( $r = .71$ ). If the perception of effort is directly proportional to the absolute oxygen consumption, women tend to rate their perception of exertion at a higher level than men (Demello et al., 1987; Faulkner & Eston, 2007; Garcin, Fleury, Mille-Hamard, & Bill, 2005; Pincivero, Coelho & Campy 2004).

Table5. Average values of CR-10 and heart rate measured in all exercises in girls

n	Estimated CR-10	Estimated HR <sub>1</sub> (beats/min)	Estimated average %HR <sub>max1</sub> (%)	Actual CR-10	HR <sub>2</sub> (beats/min)	Average %HR <sub>max2</sub> (%)
177	4,2	149,7	76	5,1	162,2	81,8

*Legend: CR-10 - perception of load measured by exercise; HR<sub>1</sub> - estimated heart rate measured during exercise; HR<sub>2</sub> - the actual average heart rate measured during exercise; %HR<sub>max1</sub> - The intensity of the estimated average heart rate measured during exercise; %HR<sub>max2</sub> - The intensity of the actual average heart rate measured during exercise*

The results show higher accuracy in evaluation of the perception of stress in girls than in boys, which may be caused by previous experiences of the female players who measured the intensity of load during matches (Belka et al., 2011). Therefore the girls could get an overview about their load during training. An important role in assessing the load can play the players' fitness level. Girls during a training microcycle complete five training units, while boys only three. Table 4 shows that the boys did not undergo the same load as girls. They might not reach the usual load during the training due to the process of measuring.

Even in the research group of girls CR-10 cannot be understood as an accurate indicator for comparing the intensity of the load. We believe that the value of CR-10 do not reach the precision values HR mainly due to the physical character of handball which is an intermittent physical activity, wherein the intensity of the load is alternated as desired. To precisely express the average value can thus be very difficult. Another reason for inaccurate rating through CR-10 may be lack of experience with the evaluation of perceived fatigue of the monitored subjects.



## CONCLUSION

Evaluation of the perception of the intensity of the load using the Borg scale in training handball did not reach the precision of the actual values of heart rate. Most of the players trained on the scale of CR-10 on the level of 4, which corresponds, according to the authors Barbero-Alvarez, Soto, Barbero-Alvarez and Grand-Vera (2008) to the load of moderate intensity (75-80%  $HR_{max}$ ). Among the players there was statistically significant difference between the subjective opinion of the perception of the intensity of the load and the actual heart rate. The opinion, that some people are unable to recognize and control the load according to their subjective feelings, coincides with more authors (Dunbar, 1993; Whaley, Brubaker, Kaminsky, & Miller, 1997), and they add that in practice it is always necessary to verify whether it is a subject suitable for RPE method. Whaley Brubaker, Kaminsky and Miller (1997) suggest that up to 30% of individuals may have a problem with understanding RPE method and their feelings.

In the perception of fatigue there was a difference between girls and boys in handball training. Estimation of girls was more accurate than in the study of Mocková, Radvanský and Matous (2000). In our study (only in girls) there was partially confirmed the fact found in similar research (Rampinini et al., 2007; Casamichana & Castellano, 2010), where the studies showed better reproducibility of heart rate and CR-10 at higher intensities of exercise. Girls had higher average intensity during training than boys. Boys in the perception of intensity significantly overestimated their load (CR-10 (estimated) = 6, CR-10 (actual) = 3), while girls slightly underestimated their load (CR-10 (estimated) = 4, CR-10 (actual) = 5). Our results of comparison male and female CR-10 protocols in relatively identified intensity get different from other previous studies of Dunbar (1993), Eston and Williams (1988), Robertson et al. (2000) and Mocková, Radvanský and Matous (2000), where women in these studies evaluated the intensity of the workload expressed relatively almost identically with men (Mocková, Radvanský, Matthew, 2000).

How to increase the accuracy of athlete's estimation in regulating exertion for the method to be applicable? Some authors suggest that RPE and CR-10 is easily learnable (Monahan, 1988), but do not provide any information about what the practice of filling in the forms should be like (Mocková, Radvanský, Matous, 2000). In some studies, the familiarisation was done (Dunbar, Goris Michielli, & Kalinski, 1994; Dunbar, Kalinski, & Robertson, 1996; Dunbar et al., 1992; Eston, & Thompson, 1997) and it has been partially performed in the girls of this study. Girls with experience in measuring the subjective intensity load achieved better results than boys without such experience. It is clear that

practice of processing the measurements should be for some athletes probably longer. We believe that the education of athletes is an important factor affecting the quality of the perception of self. Coaches should pay considerable attention to the work of load during the training process. Prediction and assessment of the intensity of load is a trainer's important skill. Therefore, we recommend use different methods of measuring the intensity of the load, including Borg scale. In our opinion, the perception of the body is an important part of the training process, not only for assessing intensity, but also for the knowledge of self. Therefore, this method should not be neglected in the training process. Players should be able to accurately estimate their own abilities with increasing fatigue in order to avoid underestimation or overestimation of their abilities (especially motion). Despite the research the training units were not "degraded" or negatively affected. For this reason, Borg scale seems an appropriate research tool for identifying players' own perceptions of physical exertion in the training process in sports games.

The limits of the present study, we see primarily in a small number of tested training sessions, fitness of the subjects, subjects with experience in measuring of their heart rate at different level and subjects of different age. In further studies, it would be useful to monitor the amount of lactate in the blood as an additional factor of physical load.

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## **ANALÝZA ROZDIELU MEDZI SUBJEKTÍVNYM VNÍMANÍM INTENZITY ZAŤAŽENIA A SKUTOČNOU SRDCOVOU FREKVENCIOU U HRÁČOV A HRÁČOK V TRÉNINGU HÁDZANEJ**

### **SÚHRN**

Srdcová frekvencia je najčastejšie používaným znakom intenzity zaťaženia v pohybovej aktivite. Jednou z alternatívnych foriem jej určenia je subjektívne hodnotenie športovca. Subjektívne hodnotenie intenzity zaťaženia môže ovplyvňovať efektívnosť v tréningovom procese. Predložená štúdia sa zaoberá využitím Borgovia škály (CR-10) u adolescentov v tréningu hádzanej. Výskum bol vykonaný u skupiny 32 hádzanárok a hádzanárov v troch tréningových jednotkách. Bolo vykonané ako subjektívne hodnotenie intenzity zaťaženia, tak monitoring intenzity zaťaženia srdcovej frekvencie pomocou monitorov srdcovej frekvencie Team Polar2. Z výsledkov vyplynulo, že je stredná závislosť ( $r = .63$ ) medzi subjektívne vnímanou únavou a skutočnou srdcovou frekvenciou. Táto závislosť nastala aj v subjektívnom hodnotení intenzity zaťaženia medzi chlapcami ( $r = .47$ ) ale u dievčat bola závislosť oveľa užšia ( $r = .71$ ). Chlapci skôr nadhodnocovali a dievčatá podhodnocovala intenzitu zaťaženia.

**KLÚČOVÉ SLOVÁ:** Borgovia škála, intenzita zaťaženia, hádzaná, monitoring srdcovej frekvencie, tréningová jednotka, vnímanie únavy



# **THE ASSESSMENT OF FUNDAMENTAL MOVEMENT PATTERNS AND THE CHARACTERISTIC OF INJURIES OF WOMEN AND MEN PRACTICING POLISH FOLK DANCE**

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## **SUMMARY**

The aim of this work was to diagnose functional limitations of women and men practicing in folk dance and injury characteristic. 79 people (42 women and 37 men) participated in the study; 37 of them engage in folk dance. All participants undertook Functional Movement Screen (FMS) consisting of seven tasks assessed according to a scale assigning 0-3 points. An original survey regarding training and past injuries constituted an additional research tool. An average general result of the FMS test of the dancers being subject of the study was 15.55 for women and 16.53 for men. The results of inactive people were similar. The least number of mistakes was observed in the fourth task – shoulder mobility and the third – in-line lunge. In the fifth task one significant difference ( $p<0.05$ ) was observed between the group of dancers and the group of inactive people. Injuries mostly involved the lower limbs. A negative correlation between the result of the FMS test and the number of injuries indicates functional limitations being a cause or a consequence of injuries. Improving the quality of movement, it is possible to reduce the risk of overload and injuries.

**KEY WORDS:** folk dance, functional assessment, FMS, injuries

## **INTRODUCTION**

Dance cannot be called sport, but injuries to which dancers are exposed are very similar to those occurring in the case of professional sportsmen (Koutedakis and Jamurtas, 2004). Dance training is similar to sports training, and the negative consequences are also similar (pain, injuries) (Nilsson, et al. 2001; Poznańska, 2005; Kadel, 2006). Professional and

competitive dance requires proficiency in technique and excellence of the body structure. As a consequence, it leads to overload through frequent repetition of the same movement schemes and stress. It could be a cause of pain and discomfort which are often ignored. As studies indicate it usually leads to injuries. Dancers experience from 1.7 to 6.7 injuries in a year time, of which 60-75% are caused by overload (Hincapie, et al. 2008; Rivera, et al. 2012).

Dance includes various styles and techniques, e.g. hip-hop, jazz, modern dance or folk dance. Technical mistakes, insufficient training, unknown choreography or external environments can contribute to the occurrence of injuries (Kadel, 2006). Various studies indicate that the most frequent injuries to the musculoskeletal system include soft tissue injuries, such as sprains, strains and tendinopathy (Krasnow, et al. 1999; Rip, et al. 2006; Rivera, et al. 2012). In other studies, fatigue fractures are described as frequent injuries. Chronic injuries are mostly observed in the lower limbs and back (Hincapie, et al. 2008).

## AIM

The main cognitive objective of the studies was to assess functional limitations using the Functional Movement Screen test and characteristic of injuries in women and men engaging in Polish folk dance.

## MATERIAL AND METHODS

The study included 79 people (42 women and 37 men), of which 37 practicing folk dance (20 women and 17 men), and 42 (22 women and 20 men) constitutes the control group – physically inactive. The age of the participants was 22.11 years  $\pm$ 2.66 on average. All were characterized by appropriate body mass index (BMI: 18.5-24.99). Healthy people were qualified to the studies; people with no chronic diseases, who had not had any serious injuries in the past six months (preventing physical activity for more than a week). Biometric characteristics of the participants are included in table 1.

Tab. 1. Characteristics of the research group

		Number of people [n]	Age [years]	Body mass [kg]	Body height [cm]	Training experience [lata]
<b>Group 1</b> (dancers)	women	20	23,05 $\pm$ 3,57	57,9 $\pm$ 5,92	166,76 $\pm$ 6,2	12,85 $\pm$ 2,34
	men	17	22,94 $\pm$ 2,63	78,18 $\pm$ 12,96	181,06 $\pm$ 9,66	10,82 $\pm$ 3,76
<b>Group 2</b> (non-active)	women	22	20,92 $\pm$ 1,27	61,59 $\pm$ 8,13	169,77 $\pm$ 5,35	-
	men	20	21,8 $\pm$ 2,31	76 $\pm$ 7,44	181,9 $\pm$ 5,67	-

The Functional Movement Screen (FMS) test was used to conduct functional assessment. It was developed in order to detect functional limitations, asymmetry and predisposition to injury of individual elements of the musculoskeletal system. Performing physical tasks in relation to the FMS test requires optimal fitness level, strength, balance and flexibility (Cook, 2010). The Functional Movement Screen test consists of seven physical tasks assessed according to a scale assigning 0-3 points, where 3 means a correct implementation of the pattern; 2 means implementation of the pattern with compensation; 1 means the lack of possibility to implement the pattern; and 0 means pain which prevents movement. The FMS test consists of seven tasks: Deep Squat, Hurdle Step, In-Line Lunge, Shoulder Mobility, Active Straight Leg Raise, Trunk Stability Push-Up, Rotary Stability (Cook, et al. 2014a; 2014b).

The participants also completed the survey regarding among others the nature of trainings, the type and number of injuries related to and not related to sport.

Standard statistical analysis methods were used in the development of empirical data. The results were presented using arithmetic means ( $\bar{x}$ ), taking standard deviations (SD) into account. Dependencies were determined using the Pearson's correlation, while the significance of differences between the pairs of variables was assessed using the U Mann-Whitney test. The minimal significance level was  $p < 0.05$ .

## **RESULTS**

Female dancers being the subject of the study obtained 15.55 points on average, while male dancers obtained 16.53 in the FMS test. The results of inactive people were similar (15.36 for women and 16.4 for men). The highest result that was observed was 19 points – achieved by one woman and one man from the study group (Tab. 2). The least number of mistakes was observed in the fourth task – shoulder mobility and the third task – in-line lunge. All men from the control group performed the fourth exercise flawlessly. The sixth exercise – trunk stability push-up was the most poorly performed by women from both groups – only 6 people (3 from the study group and 3 from the control group) performed it correctly. None of the female dancers obtained the maximum number of points in the first task – deep squat. Men had problems mostly with the fifth exercise – active straight leg raise – only two people from the study group and one person from the control group did it flawlessly. In the fifth task a significant difference ( $p < 0.05$ ) was observed between the group of dancers and the group of inactive people both among women and men (Fig. 1 and 2).

Tab. 2. Overall results of FMS test

		mean value	standard deviation	min	max
women	dancers	15,55	1,70	12	19
	non-active	15,36	2,19	9	18
men	dancers	16,53	1,74	13	19
	non-active	16,40	1,23	14	18

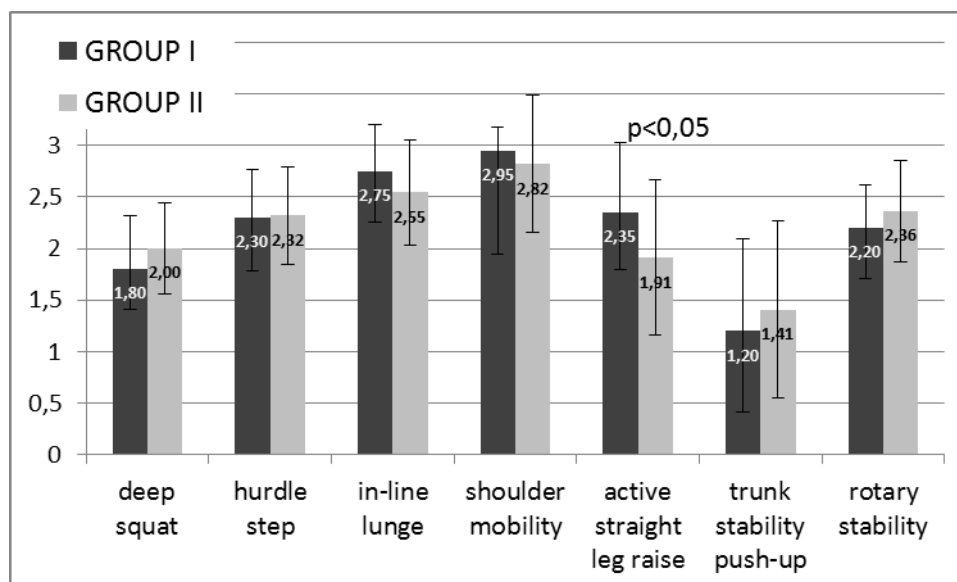


Fig. 1. Results of FMS test in women

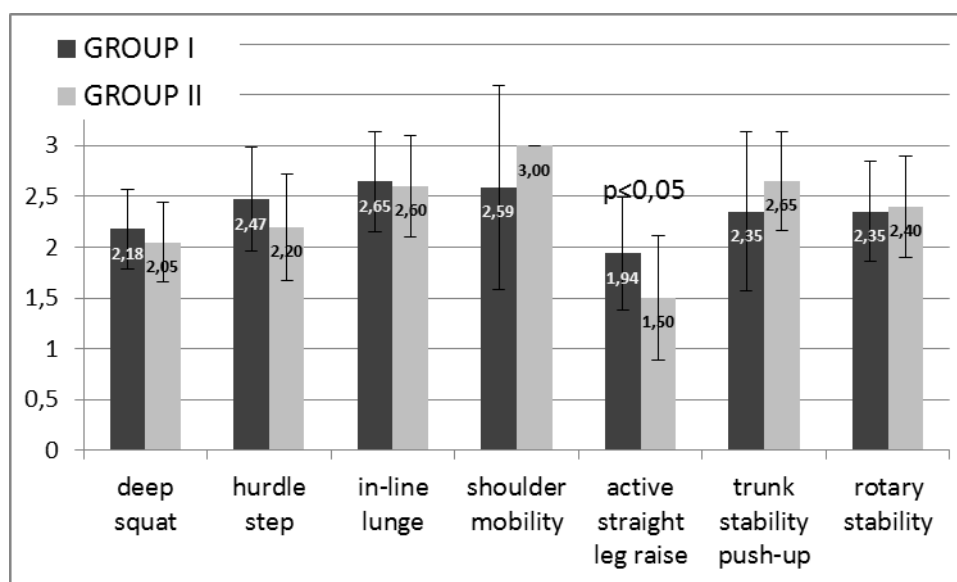


Fig. 2. Results of FMS test in men

The most frequently occurring injuries among dancers included joint dislocation and sprains. Among female dancers also bone fractures occurred frequently. Women experienced more injuries than men. No significant differences were observed between dancers and inactive people (Tab. 4). Injuries mostly involved the lower limbs (Tab. 5).

A negative correlation was observed between the number of injuries and the result of the FMS test in case of men from the study group. Moreover, a significant negative correlation was observed in women between the number of injuries and the fourth task – shoulder mobility, and in men – the third task – in-line lunge and the sixth – trunk stability push-ups (Tab. 6).

Tab. 3. Results of bilateral exercises

groups		hurdle step		in-line lunge		shoulder mobility		active straight leg raise		rotary stability	
		left	right	left	right	left	right	left	right	left	right
women	dancers	2,40	2,40	2,80	2,80	2,95	3,00	2,40	2,50	2,40	2,35
	non-active	2,50	2,45	2,59	2,73	2,82	2,82	2,09	2,14	2,41	2,41
men	dancers	2,53	2,71	2,88	2,71	2,65	2,59	2,00	2,00	2,59*	2,35
	non-active	2,30	2,40	2,60	2,70	3,00	3,00	1,65	1,65	2,50	2,45

\* p<0.05

Tab. 4. Types of injuries [n/person]

		bone fracture	dislocations and sprains	pulling taut	bruising	other
women	dancers	0,59	0,85	0,35	0,45	0,15
	non-active	0,32	0,82	0,45	0,41	0,29
men	dancers	0,29	0,71	0,47	0,35	0,05
	non-active	0,20	0,70	0,35	0,50	0,10

Tab. 5. Locations of injuries [n/person]

		head and spine	upper limb	lower limb
women	dancers	0,20	0,60	2,25
	non-active	0,23	0,45	1,32
men	dancers	0,00	0,35	1,76
	non-active	0,00	0,80	1,05

Tab. 6. Correlations (Pearson [r]) between number of injuries and results of FMS

		deep squat	hurdle step	in-line lunge	shoulder mobility	active straight leg raise	trunk stability push-up	rotary stability	sum
women	dancers	-0,109	0,065	0,025	-0,480**	-0,121	-0,230	0,139	-0,207
	non-active	-0,044	0,107	-0,058	-0,196	0,002	-0,232	-0,014	-0,151
men	dancers	0,357*	0,213	-0,619***	-0,166	0,054	-0,780***	-0,093	-0,467**
	non-active	0,207	-0,020	0,144	0,000	0,149	0,209	-0,247	0,172

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

## DISCUSSION

Injuries constitute an integral part of physical activity. According to the studies conducted by Liederbach (2000), 50-80% of dancers report injuries regardless of the type of dance. Nearly half of them (46%) experience fractures. The most frequent cause of injuries involve fatigue and mechanical injuries (Liederbach, 2000). The most frequently injured body parts among dancers include knee joints and ankle joints (Hincapie, et al. 2008; Rivera, et al. 2012 ), which has been confirmed in the author's studies.

Numerous factors impact the occurrence of injuries. According to Steinberg, the number of years of training and the number of hours of training have a significant meaning. Intensity and the time of training had a significant impact on the increase of frequency of the occurrence of injuries, especially among young dancers (Steinberg, et al. 2012). While Wanke and Mill (2013) established a dependency between dance style and injuries. The most frequently injured body parts include the lower limbs (in all styles), and the more a style varied from classical basics, the more injuries of head and neck were noted (Wanke and Mill 2013). Scientists from Australia studies the impact of the substratum on the occurrence of injuries among dancers. Floors in dancing halls were controlled using the European Sports Surface Standard, a protocol which determined standards which should be fulfilled by the substratum for sports activities. The largest number of injuries among dancers was observed on stages with the highest variability of frictional forces in different parts of the stage (Hooper, et al. 2013).

A tool used to assess the risk of the occurrence of injuries can be the Functional Movement Screen test. A set of seven movement tasks allows to comprehensively assess the quality of movement, the degree of functional limitations, symmetry and asymmetry (Lisman, et al. 2013; Lockie, et al. 2015). Studies conducted on sportsmen confirm its usefulness in individual planning of trainings and strategies to prevent injuries. A dependency between the test result and the occurrence of injuries was stated (Adamczyk, et al. 2012; Parenteau, et al. 2013; Boguszewski, et al. 2013; 2015) [20-24].

Methods to assess functional fitness, which have been developed so far, focus mainly on the assessment of muscle strength, endurance and agility. The results were referred to normative data or compared within a time unit for the same sportsmen. It does not allow the unanimous verification of functional fitness, therefore it is important to conduct an assessment of basic movement patterns prior to undertaking physical activities, as a method of preventing sports injuries. Injuries of the movement apparatus cannot be eliminated completely, but

through the assessment of functional fitness and introduction of appropriate functional training on the basis of it, we can decrease their number.

A fault of the test can also include the fact of a subjective assessment of the FMS test. The assessment of particular movement tasks is conducted on the basis of observations, simultaneously in the frontal and sagittal plane. However, the FMS test constitutes a method of assessing functional fitness applied throughout the world. It is a simple tool to conduct screening tests, assessing motor fitness not only for sportsmen, but also for healthy and physically active people. It allows to establish principles to plan physiotherapeutic proceedings and compare motor skills of sportsmen. The FMS test allows to identify multi-layer movement asymmetries between body segments. The assessment criteria of each task described in detail, standardized and certified equipment decrease the possibility of potential discrepancies in the results.

The studies regarding the assessment of functional fitness should be continued and conducted on a broader scale, also taking into account sportsmen of other disciplines. Knowledge of the result of the FMS test for a particular sportsman would allow the introduction of the functional training program, which could decrease the number of injuries.

## CONCLUSIONS

1. The lack of significant differences in the FMS test between groups of active and inactive people may indicate the lack of general development preparation and a small versatility of dance training.
2. Assessing functional fitness using the FMS test allows the introduction of an individual training, which may influence a reduction in the number of injuries. Functional limitations can constitute a cause or a consequence of injuries.

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## **HODNOTENIE ZÁKLADNÝCH POHYBOVÝCH VZORCOV CHARAKTERISTICKÉ PORANENIA ŽIEN A MUŽOV CVIČIACICH POLESKÝ ĽUDOVÝ TANEC**

### **SÚHRN**

Cieľom tejto práce bola diagnostika funkčných obmedzení žien a mužov praktizujúcich ľudový tanec. 79 osôb (42 žien a 37 mužov) sa podieľalo na štúdiu; 37 z nich sa zapojilo do ľudového tanca. Všetci účastníci vykonali Functional Movement Screen (FMS), ktorý sa skladá zo siedmich úloh hodnotených podľa stupnice priradenie 0-3 bodov. Priemerný výsledok testu FMS tanečníkov bol 15,55 a 16,53 pre ženy pre mužov. Najmenej chýb bol pozorovaných v štvrtej úlohe - mobilita ramena a v tretej - in-line výpadu. V piatej úlohe bol významný rozdiel ( $p < 0,05$ ), medzi skupinou tanečníkov a skupinou neaktívnych osôb.

**KLÚČOVÉ SLOVÁ:** ľudový tanec, funkčné posúdenie, FMS, úrazy

## **EVALUATION OF POSTURE AMONG UNIVERSITY STUDENTS**

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### **ABSTRACT**

The aim of the contribution was to determine the state of posture among students of the 1<sup>st</sup> year of university. For the evaluation a posture test devised by Jaroš and Lomíček (1957) was used. The stated somatoscope test allowed a detailed evaluation in the individual parts of the spine and parts of the body, with the methodics not being demanding on material equipment, time or evaluation procedure. For a more objective evaluation of the students we measured their BMI (body mass index) somatometric indicators.

The age of the male students was 21.2+- 0.76 years and the female students were aged 20.7+- 0.47. The average value of the BMI index was 23.07 kg/m<sup>2</sup> for the males, and 20.76 kg/m<sup>2</sup> for the females. The students belonged to the group of people with almost no risk of cardiovascular diseases or illnesses resulting from obesity.

In the evaluation of posture we found great deviations from the standard (0°-10) in forward bending of the head (HL) both for the females (22°) and for the males (24.88°). The difference between the males and the females was statistically significant (2.88°) (p<0.05). In shoulder posture (SP) the females achieved on average 11.9° and the males 14.83°. The difference between the males and the females (2.93°) was statistically significant (p<0.10) and the values were designated as average (mark 3). The females had average measured values of spinal curvature (CHK) 5.9cm, and among the males we measured 5.38cm, which corresponded to a mark of 3. The depth of the curve in the middle part of the spine (MS) was for the females 5.85cm and for the males, 3.85cm. The difference was 2cm to the detriment of the females, which was statistically significant (p<0.01). The posture of the spine in the frontal level was very good, without significant deviations for either the males or the females. We found more significant defects when evaluating the height of the shoulders (HS).

The difference between the right and the left shoulder for the males was 2.17cm, and for the females 1.90cm in favour of the left shoulder, which was higher. As regards the slope of the pelvis (SP) we found 32.50° for the females and for the males, 31.96°. According to the Jaroš-Lomíček table, grade 2 is assigned to the angle up to 35°. The optimal value for pelvic slope is 30°. In evaluating the slope of the shoulder blades (SHS) we found a value of 2.10° among the females, and for the males an average value of 2.0°. For up to 5° shoulder blades slope, the evaluation is a mark of 2. The correct slope of the shoulder blades is 0°. In both the females and the males we found normal vaulted chests.

In the overall evaluation we found average values, which means body posture with partial deviations from the correct posture in the individual parts. The statistically significant difference ( $p < 0.01$ ) is in the posture between the males and the females, with the males achieving better average posture values. Our results are of a sectional character without a causal analysis of the individual indicators.

**KEY WORDS:** Test according to Jaroš and Lomíček, posture, BMI,

## INTRODUCTION

The definition of posture has been addressed by several authors, which makes it obvious that the concept has a very wide meaning, and its definition is not simple. Externally, posture is manifested as a certain spatial arrangement of the individual parts of the body in static positions (e.g. standing) but it retains the characteristic features even when the body is in motion, for example in walking or other movement activities. (Hrčka, 2009). According to Gúth (2004) posture or the individual's posture system designates all the person's motor abilities whose purpose is to maintain position. Under the concept posture we understand the mutual positioning of the limbs, the trunk and the head - in stance, in positions and during activity. Long-term straining of the muscles with a mostly tonic function and neglect of the muscles with a mostly phasal function leads to the typical development of muscular imbalance, which is crucial from the standpoint of posture and is the backdrop for the occurrence of functional changes. Some studies have even stated that the appearance of functional changes in contemporary children and youth occurs in up to 80 %! (Fisher, 2003). Physical education is in many cases the only activity which has an effect on physical development during school years. By means of physical and sport activities we can also influence the gaining of the habit of correct posture. Posture, the holding of the body, is not only important from the health standpoint, but also socially. According to Corbin et al, (2009) posture is an important factor of non-verbal communication during first contact which

corresponds to certain personality traits of the individual. Economic factors also play an important role. Roche et al. (2007) found in their long-term study that cheap individual sustained therapeutic activities as part of prevention are more effective than costly convalescent programs in the healing of acute back pain. Many authors (Mayer, 1978, Labudová 1992, Medeková et al 1993, Kanášová, 2011) have addressed the concept of posture and evaluations of posture, but primarily with elementary school children. There is a great lack of information on the state of university students as well as on the methods of evaluation of posture, which would be useful for the diagnosing in universities. We believe that it is important, especially in today's hypo-kinetic times, to monitor university students' posture and, through movement exercises during physical education lessons, to focus on the prevention of the occurrence of acute back pain as a result of incorrect posture and muscular imbalance.

About 80% of the population in the 25-60 age category have experienced back pain during their life, but some studies (Zhu, 2007) have indicated that young people also have these problems. Most frequently, pain occurs in the lumbar or cervical part of the spine. The reason often lies in improper ways of walking and sitting (bad posture, inappropriate positions at the work-table in the home or outside it) and incorrect ways of carrying loads (bags) or unsuitable types of sustained repetitive movement (digging in the garden, continuous posture in constraining positions, etc.).

## **AIM**

The aim of the contribution is to identify the condition of the posture of university students.

## **TASKS**

1. Use of the posture evaluation test battery according to the test of Jaroš- Lomíček.
2. Measuring of the BMI somatic indicators.
3. Processing and evaluating the data.

## **METHODOLOGY AND PROCEDURE**

The subject of the investigation was a group of 24 males and 10 females from the first year at Faculty of Mechanical Engineering, Slovak University of Technology, Bratislava, who had compulsory physical education lessons, with optional disciplines. . Testing took place during the physical education lessons, always at the beginning of the class. The students were chosen at random from football, floorball and aerobics classes. We ascertained their

posture on the basis of the Jaroš and Lomíček test (1957). The experimenter measured the subject (individual tested) from a distance of roughly 1 m, with the arms slightly bent in front of them ( forearms crossed) and the centre of a protractor was placed according to the description. The experimenter was assisted by a helper who held the loosened plumb line according to instructions. The plumb line determining the vertical axis had always to hang freely.

The measuring was carried out on all the subjects by one person so the same criteria would apply throughout. The controller could also record the measurement data from time to time. The males stripped to the waist for the measuring, while the females wore tight T-shirts.

From the point of view of complexity and accuracy of measurement, this was the most suitable evaluation method.

Evaluation was focused on:

- I. head and neck posture (HP)
- II. shoulder posture (SP)
- III. spine slope (anteroposterioric plane) (SP)
- IV. back slope (anteroposterioric plane) (BS)
- V. spine course at frontal plane (SPF)
- VI. height of shoulders (HS)
- VII. pelvic slope (PS)
- VIII. shoulder-blade slope (SBS)
- IX. chest (CH)

For measuring were needed a protractor (circular with  $360^0$  scale), to which two straps are fixed, one attached to the protractor and the second moveable, a wooden triangle, a plumb line with a cord, chalk, and a pencil (Fig.1). The individual measurements are evaluated in degrees or in centimetres. The scales of values are in point form.

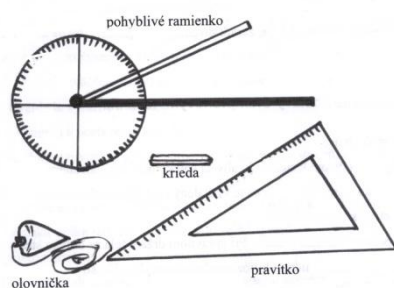


Fig. 1 The needs to measure

For diagnostics of body development we used the values of physical height and weight, and the circumference of the waist and hips. On the basis of the measured values we calculated the BMI index. We processed the data statistically and carried out objective and logical analyses. For comparison of the individual sets we used the non-parametric Mann-Whitney U-test. In the tables we presented the levels of statistical significance: (\*) $p < 0,10$ , \*\* $p < 0,01$ , \*  $p < 0,05$ .

## RESULTS

The average age of male students was 21 years and 20 years in female students. Based on the values measured in the experiment we can state that the BMI values were 23.07 kg/m<sup>2</sup> in males, with 20.76 in females (Table 1). According to the 5-grade scale the measured values can be considered normal (20 – 25 kg/m<sup>2</sup>). Our measurements have shown that the average BMI values of our students did not exceed the limits of overweight/obesity. In adults, BMI overweight value is greater than 25kg/m<sup>2</sup>, while BMI obesity value is greater than 30 kg/m<sup>2</sup>.

Table 1 BMI

BMI	Males n=24	Females n=10
Age (years)	21,2+-0,76	20,7+-0,47
Height (cm)	1,81+-0,04	1,70+-0,06
Weight (kg)	78,00+-8,36	60,00+-2,42
BMI (kg.m2)	23,07+-2,56	20,76+-1,92

The evaluation of the spine according to the Jaroš-Lomíček test is quite detailed and allows discovering faults in the body posture in particular parts of the spine.

We found great deviations from the standard (0°-10°) in head bending forward (H) both in females (22°), and males (24,88°). The difference (2,88°) between the males and females was statistically significant. A similar difference (2,39°) to the detriment of males was discovered by Hrčka (2011). They were assigned a grade 4 according to the Jaroš-Lomíček test representing the worst value of the 4-scale classification. The cervical part of the spine is considerably moveable and is statically stressed by the weight of the head. Its strain results from the forward head inclination (when working on the computer, studying etc.). This leads to an overloading of the neck and back muscles, as well as the shoulder girdle, very often causing headaches. In evaluating the posture of shoulders (SH), the value 0° expresses

the correct body posture. Females achieved on average  $11,9^{\circ}$  and males  $14,83^{\circ}$ . The difference between the males and females ( $2,93^{\circ}$ ) is statistically significant. We assigned grade 3 to the posture of shoulders in both females and males. Hrčka (2011) found lower values: an angle of  $8,06^{\circ}$  in males and  $6,79^{\circ}$  in females. We evaluated the curvature of the spine in the front-posterior level in two areas: in the cervical (C) and the lumbar (L) parts of the spine. According to Jaroš-Lomíček, correct body posture means that the cervical part of the spine is located 3-3,5 cm and the lumbar part 3-4 cm from the exercise pad. Every cm in a positive or negative direction is assigned one grade worse mark (Štěpnička, 1977). The average values of the curvature of the cervical spine were 5,9 cm in females and 5,38 cm in males. The individuals tested achieved the values of the curvature of the cervical spine that correspond on average to grade 3. Hrčka (2011) measured an average value of the curvature of the cervical spine 6.73 cm. The deviation of the curve in the lumbar part was 5.85cm in females and 3.85 in males. The difference was 2 cm, which was statistically significant. The curvature of the spine at the frontal plane (FL) with the correct body posture can be compared to a vertical line (grade 1). The value of deviation is evaluated from grades one to four. We did not record any significant deviations from the standard in the tested group. All of these students were evaluated grade 1. We can conclude that the spinal posture at the frontal level is very good. The most frequent location of disorders in the thoratical part of the spine is in the joints connecting them with the ribs and the junction to the cervical and the lumbar parts of the spine. The functional disorder results from the stress and muscle imbalance of the shortened m. pectoralis major and the weakened low stabilizers of the shoulder blades, as well as the low and middle parts of m. trapezius, m. serratus anterior, m. rhomboideus. The lumbar part of the spine and the sacral bone undergo the greatest static stress. . The functional disorder is caused by a muscle imbalance between the abdominal and gluteus muscles on the one hand and the spine muscles and flexors of the leg on the other.

When evaluating the level of shoulders (SL) within the correct body posture, the shoulders have to be in equal height and their contours should be equalized. Different level of shoulders relates to scoliotic curvature of the spine. The difference between right and left shoulders in males and females within our group was approximately the same: 2cm on average, in favour of the left shoulder – which was higher . This deviation corresponded to the grade 3. Other research results confirm our findings. We discovered the inclination of pelvis (PI)  $32,50^{\circ}$  in females and  $31,96^{\circ}$  in males. According to the chart by Jaroš-Lomíček,  $35^{\circ}$  angle is evaluated by grade 2. The optimal value of the inclination of the pelvis angle is  $30^{\circ}$  - this is the angle of the back area of the sacral bone with the vertical axis. We discovered

the value  $2.10^{\circ}$  in females and  $2.0^{\circ}$  average value in males when evaluating the inclination of shoulder blades (SBI). The inclination of shoulder blades up to  $5^{\circ}$  is evaluated by the grade 2. The correct inclination angle of the shoulder blades is  $0^{\circ}$ , it means the inner edges of the shoulder blades are positioned in parallel. We can say that the students had slight deviation from the correct posture of the shoulder blades. Greater differences have been found in the group of males.

The final evaluation parameter is the shape of the thorax (TS) which was defined by Bartošík and col. (1994). We found normal thorax both in females and males; well-vaulted, with the thoratical spine slightly kyphotic, so that its tip meets the centroidal axis led from the nape. The thorax axis is vertical, while the shoulders are directed accurately to the sides. According to the evaluation, we assigned them grade 1. The thorax evaluation scale has 4 grades. Summing up the points from the particular evaluation parameters we have found that females achieved on average 22.80 points, while males got fewer points, namely 20.29 points on average. We discovered statistically significant difference between males and females.

Table 2 Values of the test by Jaroš-Lomíček – females

Females	H in $^{\circ}$	SH in $^{\circ}$	C in cm	L in cm	FL in cm	SL in cm	PI in $^{\circ}$	SBI in $^{\circ}$	TS	Total points
Aritm.av.	22,00	11,90	5,90	5,85	0,07	1,90	32,50	2,10	1,20	22,80
Direction of dev.	3,46	1,29	1,74	0,91	0,15	0,57	2,32	0,99	0,42	2,34
Median	21,0	12,0	5,75	5,75	0,0	2,0	32,0	2,5	1,0	23,0
Min.	19	10	4	5	0	1	30	1	1	20
Max.	30	14	10	8	0,4	3	37	3	2	27
Var.range	11	4	6	3	0,4	2	7	2	1	7



Table 3 Values of the test by Jaroš-Lomíček – males

Males	H in °	SH in °	N in cm	W in cm	FL in cm	SL in cm	PI in °	SBI in °	TS	Total points
Aritm.av	24,88	14,83	5,38	3,85	0,12	2,17	31,96	2,00	1,33	20,29
Direction of dev.	3,60	4,37	1,13	1,60	0,26	0,64	1,92	0,93	0,56	2,29
Median	25	15	5,25	3,25	0	2	31,5	2	1	20
Min.	19	9	3,5	2	0	1	30	1	1	17
Max.	35	25	8	7	1	4	36	4	3	26
Var.range	16	16	4,5	5	1	3	6	3	2	9

U-test	2,255*	1,671(*)	0,745	3,025**	0,214	1,083	1,023	0,338	0,566	2,780**
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## CONCLUSION

In our report we used the somatometry methodology of evaluation of the spine shape according to Jaroš-Lomíček (1957). This methodology evaluates particular parts of the body in details and does not require complicated material equipment. It is important to execute the evaluation by the same examiners to avoid considerable measuring deviations. Regular physical activity in students with higher stress was done by the activity within the compulsorily optional physical training once a week. The physical training activities affect the improved appearance, condition, the body fat control. The regular physical activities bring the health benefits in future, like lower risk of the muscle injuries, reduction of the spine pain risk, fast recovery after exhausting work, high working effectiveness and increased ability to cope with stress. Walking from and to school was one of their other physical activities. But, in their opinion, they spend a good part of the day sitting due to the studies. As a result, we hypothesized that their body posture would deteriorate. We discovered more significant defects only in the different levels of the shoulders and the shoulder blades resulting in bulging abdomens. In contradiction to our hypothesis, we found almost perfect body posture in female students. The discovered deviations from the standard, which defines the correct body posture, might be caused by the sedentary nature of their daily activities, incorrect body posture when sitting at the computer and during lectures, an improper carrying of bags and other equipment, as well as insufficient regular physical activity, apart from compulsory

physical training once a week. We agree with Kolář (2007) that in a civilized society it is utterly irresponsible not to encourage young people to develop correct body posture and leave it on the nature. In conclusion, it is necessary to state that up till now there are no other research works available that evaluate body posture in adults. The only research works published relate to groups of 11-12 years old children. However, our results have a profile character, without undertaking causal analysis of particular coefficients.

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## **HODNOTENIE DRŽANIA TELA ŠTUDENTOV VYSOKEJ ŠKOLY**

### **SÚHRN**

Cieľom príspevku bolo zistiť stav držania tela u študentov 1.ročníka vysokej školy. Na hodnotenie bol použitý test hodnotenia držania tela podľa Jaroša a Lomíčka (1957). Uvedený somatoskopický test nám umožňuje podrobné hodnotenie v jednotlivých časti chrbtice a častí tela, pričom metodika nie je náročná na materiálne vybavenie, čas a metodiku hodnotenia. Pre objektívnejšie hodnotenie sme u študentov zmerali somatometrické ukazovatele BMI. Vek študentov bol  $21,2 \pm 0,76$  rokov a študentiek  $20,7 \pm 0,47$  rokov. Priemerné hodnoty indexu BMI boli u študentov  $23,07 \text{ kg/m}^2$  a u študentiek  $20,76 \text{ kg/m}^2$ . Študenti patrili do skupiny ľudí s takmer žiadnym rizikom kardiovaskulárnych chorôb a chorôb vyplývajúcich z obezity.

Pri hodnotení držania tela sme zistili veľké odchýlky od normy ( $0^\circ$ - $10^\circ$ ) v predklone hlavy (HL) ako u žien ( $22^\circ$ ) aj u mužov ( $24,88^\circ$ ). Rozdiel ( $2,88^\circ$ ) medzi mužmi a ženami bol štatisticky signifikantný ( $p < 0,05$ ). V držaní ramien (RA) ženy dosahovali v priemere  $11,9^\circ$  a muži  $14,83^\circ$ . Rozdiel medzi mužmi a ženami ( $2,93^\circ$ ) bol štatisticky signifikantný ( $p < 0,10$ ) a hodnoty sa označujú ako priemerné (známka 3). Ženy mali priemerné namerané hodnoty zakrivenia krčnej chrbtice (CHK)  $5,9\text{cm}$  a u mužov sme namerali  $5,38\text{cm}$ , čo zodpovedalo

známke 3. Hĺbka oblúka v driekovej časti chrbtice (CHD) bola u žien 5,85cm a u mužov 3,85cm. Rozdiel bol 2cm v neprospech žien, čo bolo štatisticky signifikantné ( $p<0,01$ ). Držanie chrbtice v rovine frontálnej bolo u mužov aj u žien veľmi dobré, bez výrazných odchýliek. Výraznejšie nedostatky sme zistili pri hodnotení výšky ramien (VR). Rozdiel medzi pravým a ľavým ramenom bol u mužov 2,17cm a žien 1,90cm v prospech ľavého ramena, ktoré bolo vyššie. Sklon panvy (SP) sme u žien zistili  $32,50^\circ$  a u mužov  $31,96^\circ$ . Do  $35^\circ$  podľa tabuľky Jaroša-Lomíčka je známka 2. Optimálna hodnota sklonu panvy je  $30^\circ$ . Pri hodnotení sklonu lopatiek (LO) sme zistili u žien hodnotu  $2,10^\circ$  a u mužov priemernú hodnotu  $2,0^\circ$ . Do  $5^\circ$  sklonu lopatiek je hodnotenie známkou 2. Správny sklon lopatiek je  $0^\circ$ . U žien aj u mužov sme zistili normálny hrudník, dobre klenutý.

V celkovom hodnotení sme zistili priemerné hodnoty, to znamená držanie tela, ktoré má v jednotlivých častiach čiastočné odchýlky od správneho držania tela. Štatisticky signifikantný rozdiel ( $p<0,01$ ) je v držaní tela medzi mužmi a ženami, pričom celkovo lepšie priemerné hodnoty držania tela dosiahli muži. Naše výsledky majú prierezový charakter bez kauzálnej analýzy jednotlivých ukazovateľov.

**KEÚČOVÉ SLOVÁ:** Test podľa Jaroša a Lomíčka, držanie tela, BMI,

# **SPORTS RIVALRY OF WOMEN FROM SLAV COUNTRIES IN THE YEARS 1931–1934 AS REPORTED BY “PRZEGLĄD SPORTOWY” MAGAZINE**

**DROZDEK-MAŁOLEPSZA TERESA**

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## **SUMMARY**

The objective of this paper is presentation of sports rivalry among women from Slav countries in the years 1931–1934 as reported by a sports magazine “Przegląd Sportowy” [Sports Review] (in the years 1931-1934). Sports reports published on the pages of the “Przegląd Sportowy in the years 1931-1934 concerned to sports rivalry among sportswomen representing Czechoslovakia, Yugoslavia and Poland. These countries were members of the International Women’s Sports Federation. Sports rivalry among women representing Slav countries in the years 1931-1934 involved mainly the following sports events: sports games, athletic events, skating, skiing, swimming, luge, and tennis. Sports rivalry, particularly at the international level, resulted in development of sports achievements. Sports results achieved by female representatives of Czechoslovakia, Yugoslavia and Poland in individual events were relatively high. Particularly in such events as sports games (hazena [Czech handball], basketball), track-and-field and swimming.

**KEY WORDS:** women’s sports, Slav countries, the years 1931-1934, “Przegląd Sportowy” magazine.

## **INTRODUCTION**

The objective of this paper is presentation of sports rivalry of women from Slav countries in the years 1931–1934 as reported by the sports magazine “Przegląd Sportowy” [Sports Review] (in the years 1931-1934). The magazine was published in the years 1921–1939. In the years 1931-1934, the magazine was published in Warszawa. It appeared twice a week – on Wednesdays and on Saturdays. “Przegląd Sportowy” reported on current sports

events in Poland and abroad. It also published articles on different aspects of women's sports movement. The volume of the magazine was usually 6 pages. The chronological scope of the paper covers the years 1931-1934 and includes, among other topics, participation of women representatives from Slav countries in the Olympic Games in Los Angeles (1932) and in the Women's World Games in London (1934). As for the state of research on the subject, the most important are the works by Teresa Drozdek-Małolepsza (Drozdek-Małolepsza 2012; Drozdek-Małolepsza 2013, Drozdek-Małolepsza 2014). The publications refer only to a small extent to the issues of this paper. In reference to preparation of this paper, a preliminary archival research of the Polish magazine "Przegląd Sportowy" in the years 1931-1934 has been used.

## **RESEARCH METHODS AND ISSUES**

The following methods were used during the research: analysis of historical sources, induction, deduction, synthesis as well as comparative analysis. The following research issues were proposed:

1. What sports events did women of Slav countries compete in between 1931 and 1934?
2. Did any increase in the level of sports achievements of women from Slav countries occur in the years 1931-1934?

## **RESULTS**

During the interwar period, one of the most important women's sports organizations was the Fédération Sportive Féminine Internationale – FSFI (Perútká, Marek, Grexa, Kössl, Reitmayer 1988). The main objective of the organisation was development and popularisation of sports among women on the international arena. Members of the FSFI were the countries in which there were independent national women's federations and the countries represented by national men's athletics unions. The Slav countries that participated in the works of FSFI included Czechoslovakia, Yugoslavia and Poland (Drozdek-Małolepsza 2015b). The FSFI congress, was held on September 15, 1932 in Vienna. The congress took decisions concerning organisation of women's sports games competition. Organisation of European basketball championships was granted to France (during the Women's World Games, the European champion was to play the final match with the Champion of the Continent of America); The European Handball Championships were organised by Germany, whereas Czechoslovakia was to organise the European Championships in hazena ("Przegląd Sportowy", 1932 No 77, p.2; 1932 No 89,p.5). On April 13, 1933, there was a meeting of the FSFI held in Rome

attended by: A. Millat (France), Bergman (Germany), Marchant, Untubers (Great Britain), Valousek (Czechoslovakia), Lindaczew (Hungary), Mersch (Switzerland) („Przegląd Sportowy”, 1933 No 31, p.2). During the meeting, Marchant gave an account of the issues connected with organisation of the Women’s World Games (WWG), which were to be held in London in 1934, women’s world records in athletics were approved, and new members – Australia, Denmark and Palestine – were enrolled by the Federation. The programme of the WWG athletics events was supplemented with pentathlon, which included a 100 meter sprint, long jump, high jump, shot put and javelin throw (the pentathlon was to be played in two days). Final matches in sports team games were to be played during the WWG in London: The European Zone Champion was to play a match with the American Zone Champion (except hazena). Swimming and fencing events were to be introduced into the WWG programme in 1938. In sports games, women were to compete in basketball and volleyball.

The successive FSFI meeting was held on August 12, 1934 in London, after the WWG („Przegląd Sportowy”, 1934 No 65, p.2). The meeting, which was managed by the President, Alice Milliat, was attended by delegations of 12 countries. Polish delegation included: H. Konopacka-Matuszewska, M. Miłobędzka i płk Mysłowski. One of the resolutions of the meeting was withdrawal of Poland from participation in the volleyball Federation, due to “the dispute about a referee in the match against France”. The Austrian Union acted in the same way in handball. The FSFI management board were elected, A. Milliat was again elected the President of FSFI, and a Pole – Major S. Sterba, was again elected to the post of one of the four vice-presidents. The delegates passed a resolution requesting the International Olympic Committee, (IOC) to consider their approval of the full programme of athletic events in the programme of the Olympic Games (OG). If the decision of the IOC were negative, the FSFI would still organise the WWG. The FSFI approved world records in women’s athletics, e.g. the ones set up by representatives of Czechoslovakia – Z. Koubkova, in the 800 m race (2 min.,12.4 sec.) and Poland: S. Walasiewicz, set up in the 80 m sprint (9.8 sec.) and J. Wajs in discus throw (43.79 m.) The delegates made a decision concerning the date of the next meeting, which was scheduled to take place in Berlin in 1936.

There was an article published in the April 1931 issue of “Przegląd Sportowy” on „Polsko-czeskie węzły sportowe” [Polish-Czech sports ties] with materials concerning rivalry between Polish and Czechoslovakian sportsmen and sportswomen („Przegląd Sportowy”, 1931 No 27, p.2). A sports competition was scheduled to take place in 1931 between the two Slav countries including, among other events of women’s sports games, athletics and swimming.

There were also materials concerning motor racing published in "Przegląd Sportowy", e.g. a Polish racing woman-driver M. Koźmianowa participated in an racing event in Hradec Kralove, in Czechoslovakia. She competed with male drivers as well ("Przegląd Sportowy", 1933 No 55, p.4). In a motor racing event for sports cars of up to 1500 cm<sup>3</sup> e. c.c. on a 35 km track she came second. The winner was Schmidt (Czechoslovakia).

Polish club teams in hazena maintained their international contacts. In order to raise their sports level, they competed with, among others, teams from Czechoslovakia. In May 1931, women's hazena team, "Polonia" Warszawa went to Czechoslovakia to play a number of friendly matches ("Przegląd Sportowy", 1931 No 40, p.3). Polonia players made a fairly good impression in their contests with favoured Czechoslovakian team clubs; i.e. they lost (3:5) with one of the best club teams in Czechoslovakia – "Victoria" Žižkov, they lost with the SK Mlada Boleslav team (3:5) and with Mielnik (2:11), and they drew 2:2 with the "Sokol" Vinohrady team ("Przegląd Sportowy", 1931 No 44, p.5). In a commentary on their performance, the magazine's reporter wrote: "Polish hazena grew out of its infancy a long time ago. Our ladies braced up their courage and set off for their first "real" tour abroad, to Czechoslovakia, the cradle of this sport, which is ideal for women (...). The team of "Polonia", together with their solicitous coach, Kwast, was warmly welcome in all places that they visited" ("Przegląd Sportowy", 1931 No 44, p.5).

The next tour of Czechoslovakia made by Polish female hazena players took place at the beginning of September 1931 ("Przegląd Sportowy", 1931 No 71, p.2). Poland was represented by women players from Lodz and Warszawa clubs. Before their departure, the players attended a few day keep-fit training camp in the premises of the Central Institute of Physical Education (CIPE). The coaching staff of the camp included Lieut. Baran and Przewracki. Composition of the team who left for Czechoslovakia included: Gawska, J. Duch, Olczak i Smidówna („Polonia”), C. Gapińska, J. Głazewska i M. Kwaśniewska (ŁKS), Wierzbowska („Warszawianka”), Z. Wiszniewska (AZS Warszawa), B. Połomska (HKS Łódź). The Polish national team played two matches with a Prague team, drawing 4:4 and losing 1:5, and they lost to Mielnik (4:9) ("Przegląd Sportowy", 1931 No 73, p.6). Despite the unfavourable results, the sports level presented by Polish team was fairly good. An outstanding role in the development of hazena in Poland was played by S. Smidovna, a player of Czech origin ("Przegląd Sportowy", 1931 No 82, p.3). She completed her secondary education in Czechoslovakia, where she learnt to play hazena. After she had come to live in Poland, she had a copy of official hazena regulations sent to her from Prague.



The most important competition in 1934, for Slav national hazena teams was their participation in the Women's World Games (WWG) in London. In June 1934, Polish national team were preparing in a sports camp for the July match with Yugoslavia. The camp took place in the Central Institute of Physical Education. It was attended by female hazena players from Krakow, Lodz and Warszawa. The manager of the camp was Capt. J. Baran ("Przegląd Sportowy", 1934 No 53, p.1). Polish national team was to play a qualifying match for WWG against the national team of Yugoslavia. At first, the match was scheduled to take place in Prague. In the end, it was played on July 8, 1934 in Zagreb ("Przegląd Sportowy", 1934 No 46, p.6). There were short notes published in issues No 53 and 54 of "Przegląd Sportowy" concerning the national team's journey to the match with Yugoslavia ("Przegląd Sportowy", 1934 No 53, p.4; 1934 No 54, p. 5). The line-up of Polish national team included the following players: Cegielska, Stefańska Wiśniewska (AZS Warszawa), Kamecka, Olczak („Polonia” Warszawa), Kordowska Połomska (HKS Łódź), Filipiak, J. Głazewska, Gruszczyńska (IKP Łódź), Podbórska („Cracovia”). The coaches of the players were Lipiński and Gołąbek. Polish national team lost to Yugoslavia 3:10 ("Przegląd Sportowy", 1934 No 55, p.2). The match was held on the stadium of HASK Zagreb and was attended by 2000 hazena fans. Polish players included Stefańska, Ciesielska, Filipiak, Wiśniewska, Połomska, J. Głazewska and Gruszczyńska; whereas Yugoslavia was represented by Stankovits, Kusted, Bobińska, Oman, Czuwaj, Wernik i Pimporan. One of the representatives of Yugoslavia – Bobińska, was of Polish origin and lived in Zagreb. According to the captain of the Yugoslavian team, Balthazar, his team rightly won the match, though (...) the result should be 10:7. Polish players did not make the most of several good situations. Their greatest error was stopping to shoot at goal and throwing the ball with both hands, a habit acquired when playing basketball. Exceptional midfield players, goalkeeper good, but lacking experience" ("Przegląd Sportowy", 1934 No 55, p.2). It should be noted that the age range of the Polish team was 14 – 24, while the Yugoslav team's was 24-30. The winners of the competition, the Yugoslav team, played the WWG final match against the Czechoslovakian team. After the match against Yugoslavia, Polish team successfully played a number of matches with Yugoslav club teams, e.g. with KS "Slavia" Varaždin (5:2), with the representative team of Beograd (8:3), with Jasenica team (14:1), with representation of Ljubljana (3:1), with the team of Brod (9:10) and Nova\_Gradiška (13:3) ("Przegląd Sportowy", 1934 No 57, p.5; 1934 No 58, p. 4; 1934 No 59, p. 6). The final hazena match at WWG was played in London on August 8, 1934 ("Przegląd Sportowy", 1934 No 65, p.3). Unexpectedly, the title of the World

Champions was won by the Yugoslav team, who beat Czechoslovakia (6:4). The referee of final match was Mr Lipiński from Warszawa.

The semi-final basketball match between France and Poland was also played during the WWG in London. The French team defeated the Polish team (36:20). In the reports after the match, "Przegląd Sportowy" commentators wrote: "The game was very fast and rough. Better technique and ball control of French players was compensated by good play in the midfield and ambition of the Polish team" ("Przegląd Sportowy", 1934 No 65, p.3). In the final match the French team squared off against the USA national team. They won the world championship defeating the USA basketball players (34:23).

One of the sports disciplines, in which sports rivalry among women was particularly frequent was athletics. The calendar of sports events coordinated by Polski Związek Lekkiej Atletyki (PZLA) [Polish Athletic Association (PLA)] included international athletic competitions with Austria, Czechoslovakia and Italy ("Przegląd Sportowy", 1931 No 16, p.5). On September 27, 1931, Polish women's national team competed in Prague with Czechoslovakia ("Przegląd Sportowy", 1931 No 77, p.2; 1934 No 78, p. 1). The match was won by the Polish team (61:45) though it took place in unfavourable weather conditions. It was cold and quite windy. Polish women won the following events: J. Manteuffel won the 100 m sprint (12.6 sec.) and the 200 m sprint (26.4 sec.); J. Wajs won the discus throw (35.19 m); W. Jasińska won the javelin throw (33.40 m) and shot put (10.96 m); they also won the 4x100 m relay race (52.5 sec.). As for the Czechoslovak athletes: Sychrova won the 80 m hurdle race (12.8 sec.) and long jump (5.11 m); Ulrichova won the high jump (1.50 m); Halupkova came first in the 800 m race – 2 min. 32.0 sec. ("Przegląd Sportowy", 1931 No 78, p.1). The editors of "Przegląd Sportowy" published very positive opinions about the performance of Polish women athletes in Prague ("Przegląd Sportowy", 1931 No 79, p.4).

A year later, on June 26, 1932, another athletics match took place in Lviv between women's national teams of Poland and Czechoslovakia and it was also won by Polish women (63:43) ("Przegląd Sportowy", 1932 No 51, p.2; 1932 No 52, p.2). Polish contestants, who won their events for Poland were: A. Breuer won the 60 m sprint (7.8 sec.) and the 100 m sprint (12.4 sec.); F. Schabińska won the 80 m hurdle race (12.4 sec.); W. Jasińska won the shot put (12.00 m – a result better than the Polish record); J. Wajs won the discus throw (40.40 m); Piotrowska won the long jump (4.94 m), and . Breuer, A. Sikora, O. Tabacka „Orłowska”, F. Schabińska won the 4x100 m relay race (51 sec.). Czechoslovak women who won their events were: Vejrikova won the 100 m sprint (27.2 sec.); Zdena Koubkova came first in the 800 m race (2 min. 29.0 sec.); Ulrichova and Z. Koubkova won the high jump

(both 1.46 m); Štěpánka Pekárová won the javelin throw (33.34 m.). The slightly poorer results were influenced by bad weather conditions. It was cold and windy. It should be stressed that the competition attracted 3000 fans of athletics.

Women athletes from Slav countries entered for international events to compete individually. At the end of May and the beginning of June 1931 there was a sports competition held in Florence on the occasion of “the Feast of Grace and Sports”. Competitors from different countries, such as: Czechoslovakia (Blehova, Krausova, Peskova, Z. Smolová, Vodickova, Ulrichova); Yugoslavia (Krajnovic, Neferovic, Tratnik) and Poland - Helena (Frieda) Bersohn, W. Jasieńska, J. Manteuffel, F. Schabińska (“Przegląd Sportowy”, 1931 No 45, p.6; Drozdek-Małolepsza 2012; Drozdek-Małolepsza 2013). Due to a large number of contestants, there were preliminary qualifications held and then the final competition. Among the representatives of the Slav countries, the best results were achieved by: The discus throw event was won by Blechova, H. Berson came third, Neferovic came fifth and the sixth place was taken by Vodickova; Tratnik came 2<sup>nd</sup> in high jump (1.45 m), the 6<sup>th</sup> place was taken by Ulrichova (1.40); W. Jasieńska won the 2<sup>nd</sup> place in shot put (11.64 m), Vodickova took the 5<sup>th</sup> place (10.27 m), and Neferovic took the 6<sup>th</sup> place (10.10 m); in the long jump event Tratnik won the 3<sup>rd</sup> place (5.03 m), the 4<sup>th</sup> place was taken by Krajnovic (4.99 m); J. Manteuffel came 4<sup>th</sup> in the 60 m sprint (8.2 sec.); in the 100 m sprint, Krausova came 4<sup>th</sup> and Manteuffel took the 5<sup>th</sup> place; the 5<sup>th</sup> place in the 80 m hurdle race was taken by F. Schabińska and Peskova won the 5<sup>th</sup> place in the javelin throw event (31.10). In the 4x75 m relay race, the 3<sup>rd</sup> place was taken by Czechoslovakia, Yugoslavia took the 5<sup>th</sup> place, whereas, in the 4x100 m relay race Czechoslovakia athletes took the 3<sup>rd</sup> place again and Yugoslavia came in sixth (“Przegląd Sportowy”, 1931 No 45, p.6). The competition in Florence was regarded as successful for the representatives of the Slav countries, which was reflected by a good level of performance of the Czechoslovakian and Polish athletes, as well as by the increased level of this field of women’s sports in Yugoslavia.

At the beginning of September 1933, the athletics competition “Masarykove Hry” was held in Prague. Two Polish athletes participated in the competition – J. Wajs and S. Walasiewicz (“Przegląd Sportowy”, 1933 No 44, p.6; 1933 No 45, p. 1). J. Wajs won the discus throw (41.57 m) and shot put (11.22 m) events; whereas S. Walasiewicz came in second in the 100 m sprint. The sensational winner of the event was Z. Koubková – 12.6 sec. (Czechoslovakia) . The other Czechoslovakian athletes who distinguished themselves were Dudova (2<sup>nd</sup> place in discus throw – 33,14 m) and Š. Pekárová (2<sup>nd</sup> place in shot put – 10.41 m). Both Polish athletes, together with Czechoslovakian athletes, won the 4x100 m relay sprint,

outstripping SK Smichov. In the commentary on the competition published on the pages of "Przegląd Sportowy", we can read: "Masarykove Hry" was a wonderful sports manifestation, which surpassed the preceding ones in the number of participants, as well as in the quality of the achieved results ("Przegląd Sportowy", 1933 No 45, p.1).

It is worthy of note that the women athletes from Slav countries competed during the sports event organised on the occasion of Slavic Scouts Jamboree in Prague in July, 1931 ("Przegląd Sportowy", 1933 No 54, p.4).

Participation in sports competition at the worldwide level was an important incentive for development of athletics among women in Slav countries. During the OG in Los Angeles in 1932 Polish athletes won two medals. The greatest success was achieved by S. Walasiewicz, who won the 100 m sprint with a result better than the world record (11.9). The second place in this event was taken by Hilda Strike (Canada). Wilhelmine von Bremen came in third. J. Wajs with the result – 38.74 m, won a bronze medal in discus throw. The editorial staff of "Przegląd Sportowy" commented the result achieved by J. Wajs as follows: "We have encountered the greatest disappointment of the Olympic career. J. Wajs took the third place in discus throw with the result that does not match any other of her results this year," ("Przegląd Sportowy", 1932 No 63, p.2). F. Schabińska came in fourth in the 80 m hurdle race, with the result of 12.3 sec. and did not qualify for the final race.

The 4<sup>th</sup> WWG were another very important event including rivalry of athletes in its programme. The games were held in London, between August 8 and August 11 1934 ("Przegląd Sportowy", 1934 No 65, p.1). The Slav countries were represented in the games by Representative athletes of Poland and Czechoslovakia. The Slavs achieved sports success at the games. As for the representatives of Poland, J. Wajs won the first place in the discus throw contest with the world record result of 43.79 m. Another world championship title for Polish team was won by S. Walasiewicz in the 60 m sprint (7.6 sec.). In the 100 and 200 m sprint races, S. Walasiewicz came in second. The winner was Käthe Krauss from Germany. Among the Czechoslovakian athletes, the most successful was Z. Koubkova, who won the gold medal in the 800 m race with a result better than the world record (2 min. 12.4 sec.) and a bronze medal in long jump (5.70 m). Apart from that, Š. Pekárová won the third place in the shot put event (11.82 m) and in the athletics pentathlon ("Przegląd Sportowy", 1934 No 65, p.3). Among the athletes who took one of the top six places a few Poles should be mentioned. M. Kwaśniewska gave a good performance taking the 4<sup>th</sup> place in javelin throw (39.21 m), and taking the 6<sup>th</sup> place in the athletics pentathlon. J. Wajs took the 4<sup>th</sup> place in shot put (11.51 m), whereas G. Kobielska-Cejzik came in fifth (10.61). Apart from that G. Kobielska-

Cejzik took the fifth place in the discus throw event (36.06 m). During the WWG in London, the athletics events were dominated by German athletes, who won 9 out of 12 events. Polish athletes won 2 events, whereas Czechoslovakian athletes won 1 event. In the WWG team table, athletics was won by the German team (95 pts.) who outdistanced Poland (32 pts.), Canada (22 pts.), Czechoslovakia (18 pts.), the republic of South Africa (14 pts.), Sweden (11 pts.), Japan (10 pts.), Austria (9 pts.), Holland (6 pts.), and France (2 pts.). Participation of Czechoslovak and Polish feminine athletes in the 4<sup>th</sup> WWG in London should be regarded as very successful (*“Przegląd Sportowy”*, 1934 No 65, p.3, Drozdek-Małołepsza 2014).

Representatives of Slav countries competed in winter sports, e.g. skating, skiing and tobogganing. In February 1933, the 1<sup>st</sup> *“Slovenskie Zimny Hry”* – the 1<sup>st</sup> *“Slavic Winter Games”* were held in Moravska Ostrava (*“Przegląd Sportowy”*, 1933 No 16, p.6). National teams of Czechoslovakia, Yugoslavia, Poland and Russia (in exile) as well as Lithuania and Latvia participated in the competition. In figure skating, the 1<sup>st</sup> place was taken by E. Popowicz, who outdistanced E. Czor (both of them Polish), and Vesely and Skopalova (Czechoslovakia). The pair skating event was also won by Polish representatives – Z. Bilor and T. Kowalski, the second place was taken by T. Rudnicka and A. Theuer, and the third place was won by the Vesely siblings – Czechoslovakia (*“Przegląd Sportowy”*, 1933 No 16, p.6). In speed skating events, Poland was represented only by Lena Łukasik and Kalatówna.

Another competition took place on the 5<sup>th</sup> day of March 1933 in Prague. It was attended by figure skaters from Austria, Belgium, Czechoslovakia, Poland, and Germany (*“Przegląd Sportowy”*, 1933 No 19, p.2). Z. Bilor and T. Kowalski turned out to be the best in pair skating event, outdistancing the Austrian pair, Kaiser and Kast and the Veselys.

The Pan-Slavic Skating Competition took place in Warsaw on 2 – 4 February, 1934. It was attended by the national teams of Czechoslovakia and Poland (*“Przegląd Sportowy”*, 1934 No 9, p.6). The individual figure skating event was won by E. Popowicz, who outdistanced the Czechoslovakian skater Miksova. Speed skating events were dominated by Polish skaters. The Allround Speed Skating event was won by Lena, before Sutyńska and Jabłońska. The Czechoslovak speed skater – Bergerova took the 4<sup>th</sup> place (*“Przegląd Sportowy”*, 1934 No 11, p.4).

Between January 5 and January 7, 1934, international figure skating competition took place for the third time in Zakopane. The event was attended by sportsmen and sportswomen from Czechoslovakia, Germany, Hungary, and Poland. The single figure skating event was won by the German champion – Michaeli (BSC Berlin), who outdistanced her compatriot, Schmidt (BSC). E. Popowicz took the very good, third place and the fourth place was taken

by Holbauer (TEV Czechoslovakia). The first place in the sports pair skating team event was taken by Z. Bilor and T. Kowalski, the second place was won by the Hungarian pair Takacs and Balas and the third by the Źmudzinskis – Poland (“Przegląd Sportowy”, 1934 No 3, p.6).

At the end of January 1934, European Championships in figure skating took place in Prague. Polish pair, Z. Bilor and T. Kowalski, performed very well and won the bronze medal. They lost only to the Hungarian pair (Rotter – Szollás) and the Austrian pair (Papetz – Zwack). Czechoslovakia was represented by three pairs of skaters: Jäger and Lesk took the 6<sup>th</sup> place, Eisebel and Friedel took the 8<sup>th</sup> place, and the Veselys took the 10<sup>th</sup> place. Sonja Henie (Norway) won European Championship in the singles competition, whereas the representative of the host country – Metzner, came in on the 10<sup>th</sup> position (“Przegląd Sportowy”, 1934 No 10, p.3).

There were numerous sports contacts between Polish and Czechoslovakian skiers. A skiing event took place in mid-January 1931. The 1<sup>st</sup> class 8 km cross-country skiing event was won by Z. Stopówna (Poland). The 2<sup>nd</sup> class cross-country skiing event was won by Z. Giewontówna (Poland), who outdistanced Czechoslovak skiers: Schmerlavská, Valentin and Nesavdalova (“Przegląd Sportowy”, 1931 No 4, p.4).

The best Polish skier, Bronisława Staszek-Polankowa, did not participate in Polish championships in skiing, which took place between March 4 and March 6, 1932, in Zakopane, because at that time she participated in a Sokol competition in Czechoslovakia (“Przegląd Sportowy”, 1932 No 20, p.1). Polish skiers participated in an international downhill skiing event in Vesterov (Czechoslovakia). Zofia Stopkówna won the 2<sup>nd</sup> place, losing only to with Annika Eleöd (Hungary). The event for junior skiers was won by Gutówna (“Przegląd Sportowy”, 1932 No 19, p.3).

One of the most important international events for women in skiing Pan-Slavic Championships that took place between February 17 and February 20 1933. The skiing events were won by B. Staszek-Polankowa. In the cross-country skiing race she outdistanced skiers from Czechoslovakia – Kožarova and Provažnikova, whereas in the 2 km downhill race, she defeated Provažnikova and Visnyakova (“Przegląd Sportowy”, 1933 No 16, p.2). B. Staszek-Polankowa and Z. Stopkówna participated in the International Ski Championships of Czechoslovakia, which took place at the beginning of March 1933. In women’s 8 km cross-country ski race B. Staszek-Polankowa won the first place, the second place went to Z. Stopkówna and the successive places were taken by Czechoslovakian cross-country skiers (Svaz club): 3<sup>rd</sup> – Dostalova, 4th –Pluharova, 5th – Kveta Letkova, 6th – Kourinova. The Total number of skiers taking part in the race was 17 (“Przegląd Sportowy”, 1933 No 19, p.1).

In the early thirties of the 20<sup>th</sup> century, the tradition of playing international swimming competitions between Slav countries was continued (Drozdek-Małolepsza 2015a). In mid-August 1931 a match between Czechoslovakia and Poland, in which men and women competed, took place in Prague ("Przegląd Sportowy", 1931 No 65, p.1; 1931 No 66, p.2; 1931 No 67, p. 6; 1931 No 68, p. 6). Czechoslovakia won the match 63:39. Czechoslovakian women swimmers won the following individual swimming events: Svitakova – 100 m freestyle (1 min. 18.4 sec. – Czechoslovakian record) and the 400 m freestyle 6 min. 50.8 sec.); 3x100 m medley relay (4 min. 37.4 sec. – Czechoslovakian record); Polish swimmers won the following individual events: K. Nowak – 100 m backstroke (1 min. 35.4 sec.); A. Jarkuliusz – 200 m breaststroke (3 min. 26.3 sec.) – a result better than Polish record; L. Klaus springboard diving and platform diving; Polish team (A. Szczerba, Szmidówna, R. Morawska, M. Kratochwilówna) in the 4x100 freestyle relay (5 min. 45.5 sec.) – a result better than Polish record ("Przegląd Sportowy", 1931 No 66, p.2). Moreover, in spite of their defeat, Polish swimmers set better results than Polish records in other events: 100 m freestyle race – R. Morawska (1 min. 21.9 sec.); 3x100 m medley relay – Polish relay team (K. Nowak, A. Jarkulisz, M. Kratochwilówna) – 4 min. 40.4 sec. Czechoslovakian victory was determined by two major factors: their win in the water polo match and taking first places in men's relay events ("Przegląd Sportowy", 1931 No 67, p. 6).

Another swimming match between Czechoslovakian and Polish male and female representatives took place on August 27 and August 27, 1933 ("Przegląd Sportowy", 1933 No 69, p. 3). The match ended in victory of the Czechoslovakian national team 58:44. In women's contest, Polish swimmers won two events: Lotta Klaus took the 1<sup>st</sup> place in springboard diving and platform diving. Other swimmers also performed quite well. Mirosława Kratochwil took the 2<sup>nd</sup> place in the 400 m freestyle race with a result better than Polish record (6 min. 35.0 sec.), and in the 100 m freestyle race with a good result (1 min. 20.0 sec.); Renata Morawska took the 2<sup>nd</sup> place in the 100 m backstroke race (1 min. 39.8 sec.); Kokalij-Kowalewska took the 2<sup>nd</sup> place in platform diving. Czechoslovakian swimmers won the following events: Freundova won the 100 m backstroke race (1 min. 33.3 sec.); Irma Schrameckova won the 100 m freestyle race (1 min. 15.4 sec.) and the 400 m freestyle race (6 min. 31.6 sec.); Hankova won the 200 m breaststroke race (3 min. 20.6 sec.); Czechoslovakian national team in 4x100 m freestyle relay (Sebestova, Freundova, Macenauerova) – 5 min. 37.2 sec. The performance of the Czechoslovakian team was extraordinarily good. Their swimmers set Czechoslovakian records in 3 events and equalled a Czechoslovakian record in 1 event.

Luge was not a very popular sport among women. Sports competitions in luge included the Polish Luge Championships with participation of foreign sportswomen. The first competition of this kind took place in Krynica at the end of January 1931 ("Przegląd Sportowy", 1931 No 9, p. 5). Lugers from Austria and Czechoslovakia (HDW) participated in the competition. In mixed team event, Polish-Czechoslovakian pair of lugers (H. Szeraucówna and Posselt (Czechoslovakia) turned out to be best out of 17 participating teams.

Czechoslovakian tennis players participated in tennis tournaments played in Poland. During the Warszawa Championships, played in May 1931, in the final mixed doubles match a player from Czechoslovakia, Malecka, together with Junżanka (Poland) defeated Pozowska (Poland and Balas (Hungary) ("Przegląd Sportowy", 1931 No 42, p. 5). One of the doubles team mate of the best Polish tennis players Jadwiga Jędrzejewska during international tournaments was Deutsch from Czechoslovakia. They played together during the German Championships in Hamburg in August 1931 ("Przegląd Sportowy", 1931 No 62, p. 4). Czechoslovakian tennis players successfully participated in the International Polish Tennis Championships in September 1931. Deutsch and Berthet (France) won the doubles event, whereas J. Jędrzejewska (after defeating Deutsch in the final) turned out to be the best in the singles ("Przegląd Sportowy", 1931 No 75, pp. 2, 3).

J. Jędrzejewska successfully participated in the International Polish Tennis Championships in September 1933. In the final of single games, she defeated a Czechoslovakian tennis player Maehautova (6:2, 6:4); whereas in the final of the mixed doubles, together with I. Tłoczynski, they defeated Merhautowa and Malecka (6:4, and 6:1) ("Przegląd Sportowy", 1933 No 73, p. 3; 1933 No 74, p.4 ).

The 1<sup>st</sup> World Winter Sports "Makkabiada" was planned to be held in Zakopane in 1933. Polish ("feminine") national team for the "Makkabiada" included the following skiers: Oberlander, L. Schwrzbart, Strahl (Zakopane), Reibsheld (Nowy Targ), Mandelbaum, Schonefeld (Kraków), Schneider, Weiss (Bielsko), Enker (Krynica), Frenkel (Żywiec); in luge: Enker ("Przegląd Sportowy", 1933 No 7, p. 4). Makkabiada in Zakopane lasted from February 1 until February 5, 1933. Women's competition included skiing and luge events. In the 8 km cross-country skiing race, the first three places were taken by Polish representatives. The winner was L. Schwrzbart, who outdistanced Enker and Oberlander. The fourth place was taken by Blan – Czechoslovakia ("Przegląd Sportowy", 1933 No 10, p. 2). The 3x5 km relay race brought victory to Polish national team (Oberlander, Enker < L. Schwrzbart), before the Czechoslovakian relay team ("Przegląd Sportowy", 1933 No 12, p. 1). The luge event



took place on the Kuźnice track. Representatives of Polish national team turned out to be the best lugers. The first place in women's singles was taken by Enker; Enker and L. Schwrzbart won the women's doubles, the mixed doubles event was won by the Enkers ("Przegląd Sportowy", 1933 No 11, p. 2). In the team score of the "Makkabiada" (points scored for women's and men's events) Poland (131 pts.) outdistanced Czechoslovakia (32 pts.) Austria (14 pts.) and Romania (8). Representatives of Yugoslavia, Norway and Germany did not win any points in the team score ("Przegląd Sportowy", 1933 No 12, p. 3).

Summer sports "Makkabiada" took place in Prague from August 20 until August 27, 1933 ("Przegląd Sportowy", 1933 No 60, p. 4). Before the competition, the contestants, e.g. Polish national team, attended sports camps, e.g. the athletes M. Freiwald, H. Gottlieb, Metzendorf („Makkabi” Kraków), Szönmanówna („Makkabi” Bielsko), Nirenberżanka („Makkabi” Krolewska Huta); and gymnasts: Jackierówna („Makkabi” Bielsko), Hojnar, Brandes, Gelbharówna - „Makkabi” Sosnowiec ("Przegląd Sportowy", 1933 No 64, p. 5). Preparations for the games made by Polish representatives were crowned with success at the competition in Prague ("Przegląd Sportowy", 1933 No 69, p. 2). In the athletic events, the first three places in the 100 m sprint were taken by Polish representatives: H. Gottlieb (13.2 sec.), M. Freiwald (13.4 sec.), Glasner (13.5 sec.); M. Freiwald won the high jump (1.34 m) and long jump (4.93 m) events. The representative of Czechoslovakia in swimming – Meinl, took the third place in the 100 m freestyle race.

## CONCLUSION

In the years 1931–1934, feminine representatives of the Slav countries participated in sports rivalry in the following sports disciplines: sports games, athletics, skating, skiing, swimming, tennis. Of all the sports disciplines, representatives of the Slav countries reached the highest level in basketball. The national basketball team of Poland was one of the best teams in Europe. Representatives of the Slav countries were very successful in sports, particularly sportswomen from Czechoslovakia and Poland, who were very successful in athletics, which resulted in three World Champion titles won at WWG in London in 1934. Apart from those, Czechoslovakian swimmers presented a very good sports level, whereas J. Jędrzejowska was an outstanding tennis player at the international arena. Women's sports contacts influenced development of sports level represented by contestants from Slav countries, which particularly evident among representatives of Czechoslovakia and Poland.

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## **ŠPORTOVÉ SÚŤAŽE ŽIEN ZO SLOVANSKÝCH KRAJÍN V ROKOCH 1931-1934 PODĽA ČASOPISU „PRZEGLĄD SPORTOWY” (ŠPORTOVÝ PREHLAD)**

### **SÚHRN**

Účelom článku bolo predstaviť športové preteky žien zo slovanských krajín v rokoch 1931-1934 podľa športového časopisu „Przegląd Sportowy” (z rokov 1931-1934). Vzťahy v oblasti športu, popisované na stránkach časopisu „Przegląd Sportowy” v rokoch 1931-1934, sa týkali pretekov dám z Československa, Juhoslávie a Poľska. Tieto krajiny boli členmi Medzinárodnej federácie ženského športu. Športové preteky žien zo slovanských krajín v rokoch 1931-1934 sa konali najmä v nasledovných disciplínach: športové hry, ľahká atletika, korčuľovanie, lyžovanie, plávanie, bobovanie, tenis. Súťaženie v športe, najmä na medzinárodnej úrovni, prispievalo k rozvoju športových výkonov. Úroveň, ktorú dosahovali v jednotlivých športových disciplínach reprezentantky Československa, Juhoslávie a Poľska, bola dosť vysoká. Týka sa to najmä športových hier (hádzaná, basketbal), ľahkej atletiky a plávania.

**KLÚČOVÉ SLOVÁ:** Ženský šport, slovanské krajiny, roky 1931-1934, časopis „Przegląd Sportowy”

# **PHYSICAL ACTIVITIES OF THE 9- th GRADES PUPILS OF ELEMENTARY SCHOOLS IN SELECTED CITIES OF SLOVAKIA**

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## **SUMMARY**

The work deals with the physical activities 788 pupils of nine grade of primary schools in selected towns from the intersexual aspect. We found that 17,78% of girls and 12,25% of boys during the work week implements physical activity less than 1 hour per day. During the weekend it is even more with 25,19% of girls and 15,13% of boys. Within the physical activity of students there is a domination of collective sports over individual sports, while more than 40% of the activities are carried out recreationally.

**KEY WORDS:** physical activity, pupils, Elementary School

## **INTRODUCTION**

The basic fundamental expressions of human life is movement and its associated physical activity that arises own efforts and commitment to the implementation of human movement and physical activity (Velé, 2006). Physical activity is understood as the all activities that produce skeletal musculature and it also produces increased respiratory and heart rate (Brettschneider, Naul, 2004). Physical activity helps to create a wide space for qualitatively higher level of refinement of human personality and psyche.

This effect has positive influence to other human activities and also to the process of education. Activity level of sports training and achievement of certain level of performance in this area is a real success and so-called extension in the process of dealing and inclusion in the society of more productive people (Lehocký, 2010). Čeledová, Čevela (2010) consider a lack of physical activity as a hallmark of the current advanced and modern times which negatively act on the health of each individual. Conversely enough physical activity has a positive effect on health promotion, for example, with preventive significance to certain chronic diseases (Zhukovska, Szark, 2010; Zhukovska, Szark-Eckardt, Muszkieta, Iermakova, 2014). Complex positive effects of physical activities are manifested in several

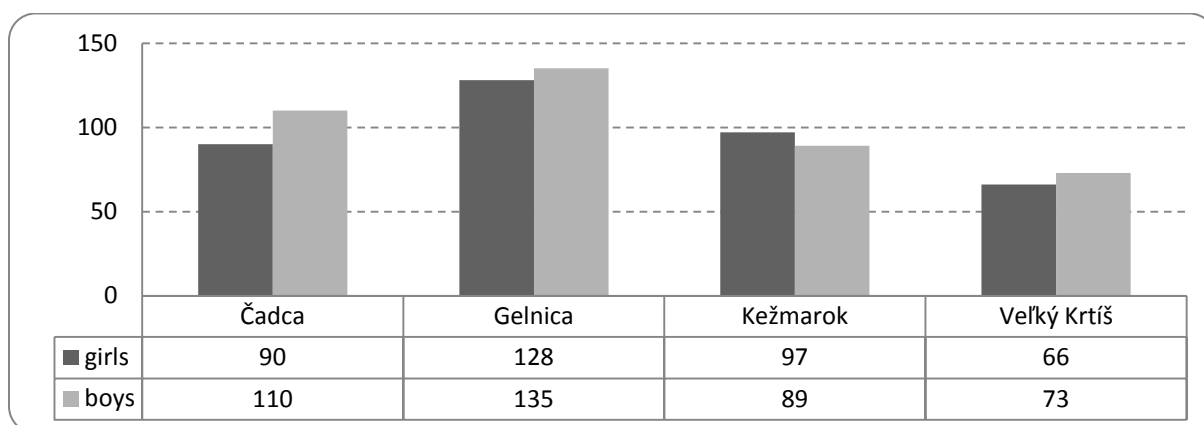
ways (Dobšák et al. 2009; Smid, 2015; Krull, 2015). For example a positive influence on the longevity, stress resistance, improve physical fitness, exercise capacity, quality of life and sleep, living habits and health. Several studies of the current period highlight the fact that volume of physical activities among adolescent population is declining (Nevolná, 2012; Krull, Cipov, 2014; Beták, 2014), and those activities are being replaced by sedentary activities: watching TV, listening to music, surfing or chatting on the internet (Bebčáková, et al., 2012).

## OBJECTIVE

Sub-tasks and objective within the grant project **KEGA 002UMB - 4/2014 "Innovation of physical activities of primary school pupils carried out in the natural environment through playful activities with the use of a global positioning system "** was to determine the volume and content of physical activities in a weekly exercise regime of pupils of nine grade of primary schools in selected cities of Slovakia .

## METHODOLOGY

Our research was done through anonymous questionnaires distributed to pupils of primary schools in selected cities of Slovakia in the first half of the school year 2014/2015. Evaluation of inquiry was carried out through the program TAP Gamo Banská Bystrica . As part of our research the key method was the interrogation method - anonymous, non-standardized inquiry , which was created on the basis needs of the research. Our research includes 788 correctly filled inquiries. The participants were 788 children, the exploration sample consisted of 381 girls, 407 boys of the nine grade of primary schools in these cities: Čadca, Gelnica, Kežmarok a Veľký Krtíš. Closer characteristic of students are presented in Figure 1. The answers of pupils we analyzed from the view of intersexual differences.



Picture 1 Characteristic of research file (n = 788)

## RESULTS

Nowadays various works and researches confirms that the increasing standard of living and the availability of different communication and media means less interest about the sport which means greater susceptibility to diseases and gradually decreasing interest in physical activity. (Slezák, Melicher, 2008). unfortunately This trend of lifestyle has already occurs among children and young people, for whose there is an increase in inactivity (Bebčáková, a kol., 2012). This state of inactivity explains Mikláňková et al. (2009) and many other authors and it is the result of continuous passive and sedentary lifestyle. Children instead of spending free time outside school by physical activities dedicated to sedentary activities such as : watching television , playing computer games , surfing on the Internet and so on. Preventing this unwanted change , it is necessary to place into the daily routine of children certain amount of physical activity, whether in school or out of school ( Simon, Vladovičová , 2010).

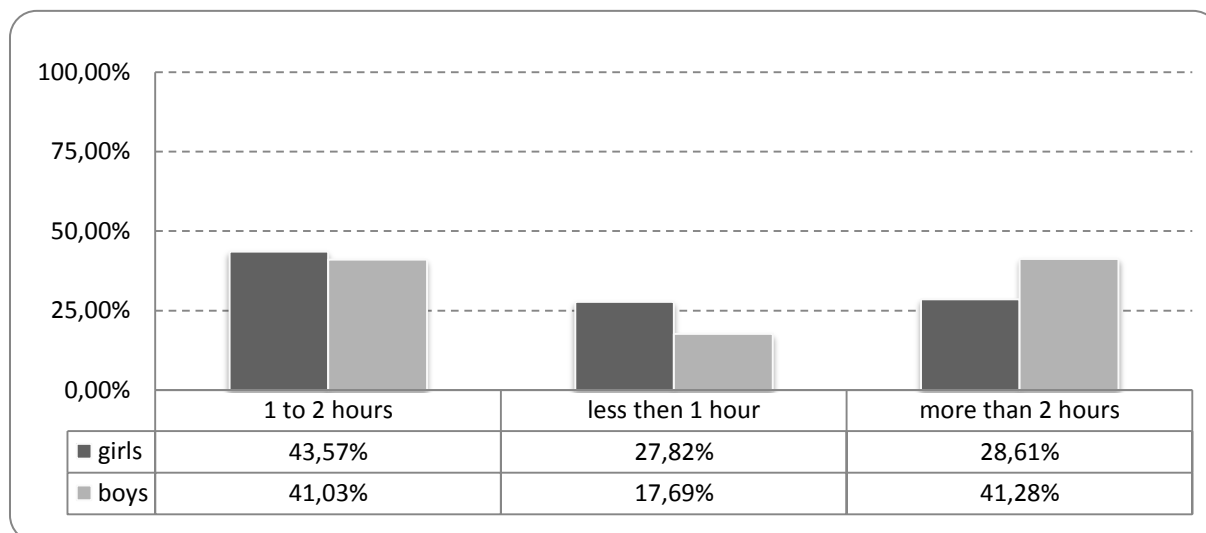
That is the way why we decided to find out the current volume and content of physical activities in a weekly exercise regime of pupils of nine grade of primary schools in selected cities of Slovakia .

The first issue was the extent of physical activities of pupils in hours during the working week. According to Šimonek (2006) category of 10-17 years old pupils should perform physical activity three hours per day. According to our research it accomplishes 41.28 % boys and 28.61 % girls (Fig. 2 ) . Over 40 % of girls and boys are performing the physical activity 1 to 2 hours per day during the week, what we can seem as a positive finding , since as pointed out e.g. researches of Nemec , Nemcova (2012), Nevoľná (2013) which are oriented on the regime of elementary school pupils in their free time where they are mainly engaged sedentary , physically undemanding activities - computer games , listening to music, watching television , and so on. We consider as a risk groups the group of girls ( 27.82 %) and a group of boys ( 17.69 %) whose perform the physical activities less than one hour per day during the week. If we want to make sports positively affecting our health, we should do sport at least every other day of the week at least for one hour (Šimonová , Vladovičová , 2010).

Bendíková (2014) in her exploration sample of 133 female students of secondary schools in Liptovsky Mikulas , with an average age of 17.3 years, found out that in terms of weekly frequencies in this group of students 24 % of respondents are involved in irregularly sports and recreational activities once a week 17 % , two times a week 12 % and three times a week or more 8 % of respondents .

It is interesting to find out that 39% of questioned pupils are not interested (addressed) in sports and recreational activities.

Pupils answers to this question from the perspective of intersex differences were very different and that fact was also reflected in determining statistical significance (Table. 1).



Picture 2 Physical activities of the pupils in hours during the working week

Table 1 Statistical evaluation - Physical activities of the pupils in hours during working week

item	boys ES/girls ES
statistical significance	**
chi – square test	p=0,0018

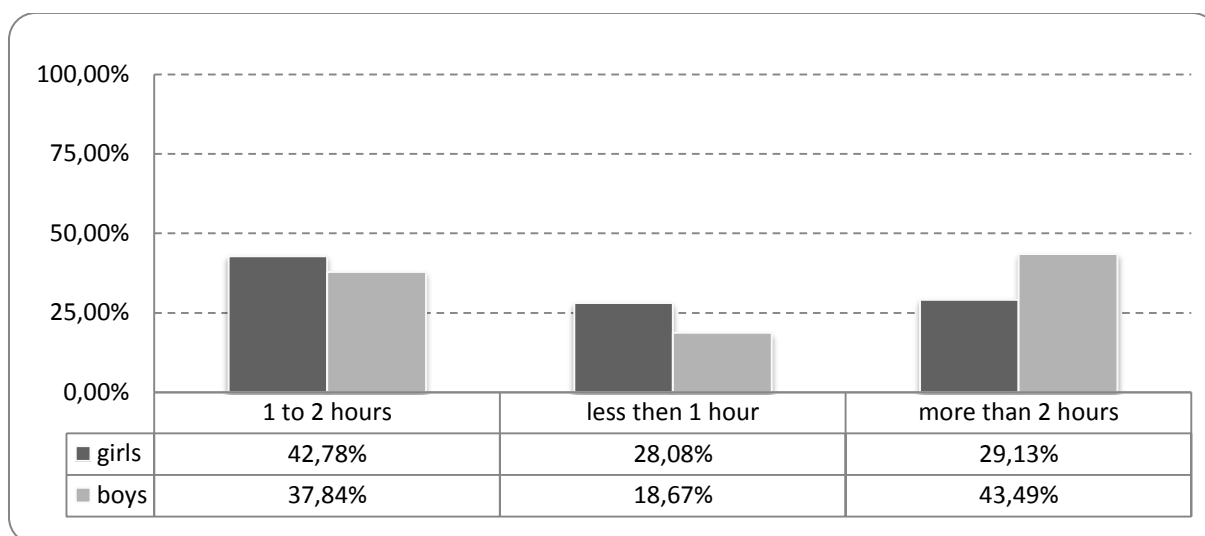
**Legend:** \*\*= statistical significance - level  $p < 0,01$ , \*= statistical significance - level  $p < 0,05$ , N= statistically insignificant

In the next issue we investigated how much time devote boys and girls physical activities during working weekends (Fig. 3), while we expected that they devote a greater extent. By comparing the answers from the previous question, we found out that physical activities for more than two hours a day have almost the same percentage of girls as well as boys, which we did not expect (Fig. 3). This fact is probably related to the fact that boys as well as girls attending organized activities during the week (training units, leisure time clubs, etc.) and during the weekend they not perform these activities.

We consider as a negative the fact that the increase in the number of girls - 28,08% whose are interested in physical activities less than 1hour per day during the weekend. Chovanová (2005) and others. based on their research also highlight that the representation of physical activity, sport and recreation activities among the youth is currently by consideration

of the requirements of the present time, in many cases insufficient. Nader et al. (2008) states that 9 years old children perform physical activity more than 3 hours during the week and weekends but with advancing age their activities decrease. At the age of 15 years they are performing the physical activity only about 49 minutes per day during the week and during the weekend it is even less - only 35 minutes daily. Such a low physical activity is according to Svačina (2010) the factor which occurs alongside obesity and its consequences such as higher blood pressure, diabetes, atherosclerosis and cancer.

Even in the evaluation of this question we observed in terms of intersexual differences statistically significant differences (Tab. 2).



Picture 3 Physical activities of the pupils in hours during the working week

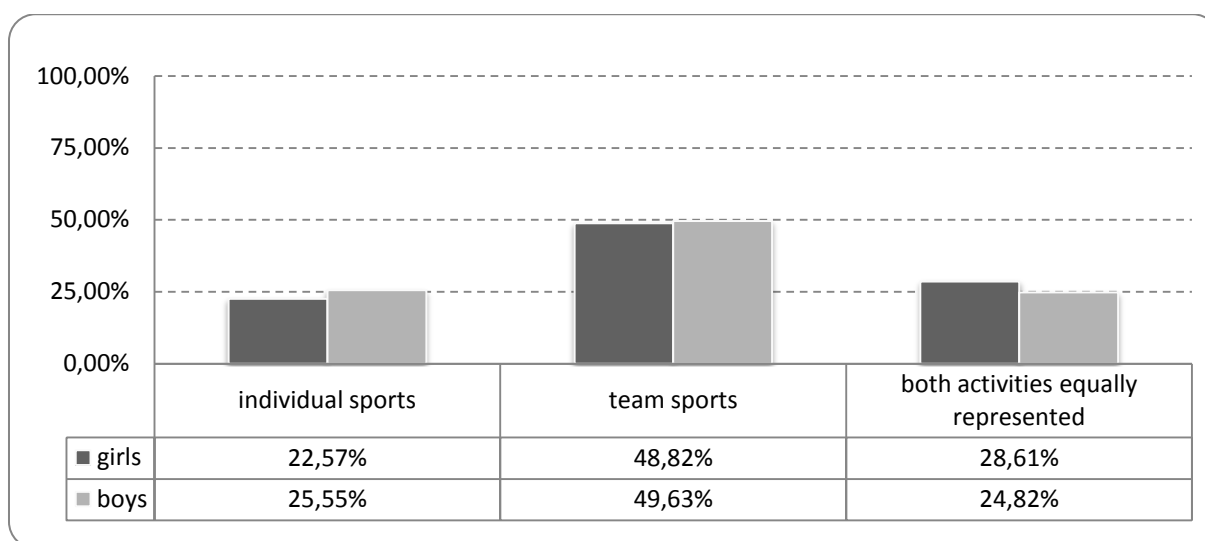
Table 2 Statistical evaluation - Physical activities of the pupils in hours during working week

item	boys ES/girls ES
statistical significance	**
chi – square test	p=0,0010

**Legend:** \*\*= statistical significance - level  $p < 0,01$ , \*= statistical significance - level  $p < 0,05$ , N= statistically insignificant

Another question was about preferred physical activities of elementary school pupils, whether collectively or individually. By the research we found out that boys (49.63%) and girls (48.82%) in physical activities much more prefer team sports over individual (Fig. 4). Individual sports prefer 22.57% of girls and 25.55% of boys. Almost one third of girls represented both activities equally. The significance of differences in answers between boys and girls was statistically significant  $p < 0.05$  (tab. 3).





Picture 4 Preferred physical activities of elementary school pupils

Table 3 Statistical evaluation - Preferred physical activities of elementary school pupils

item	boys ES/girls ES
statistical significance	**
chi – square test	p=0,0286

**Legend:** \*\*= statistical significance - level  $p < 0,01$ , \*= statistical significance - level  $p < 0,05$ , N= statistically insignificant

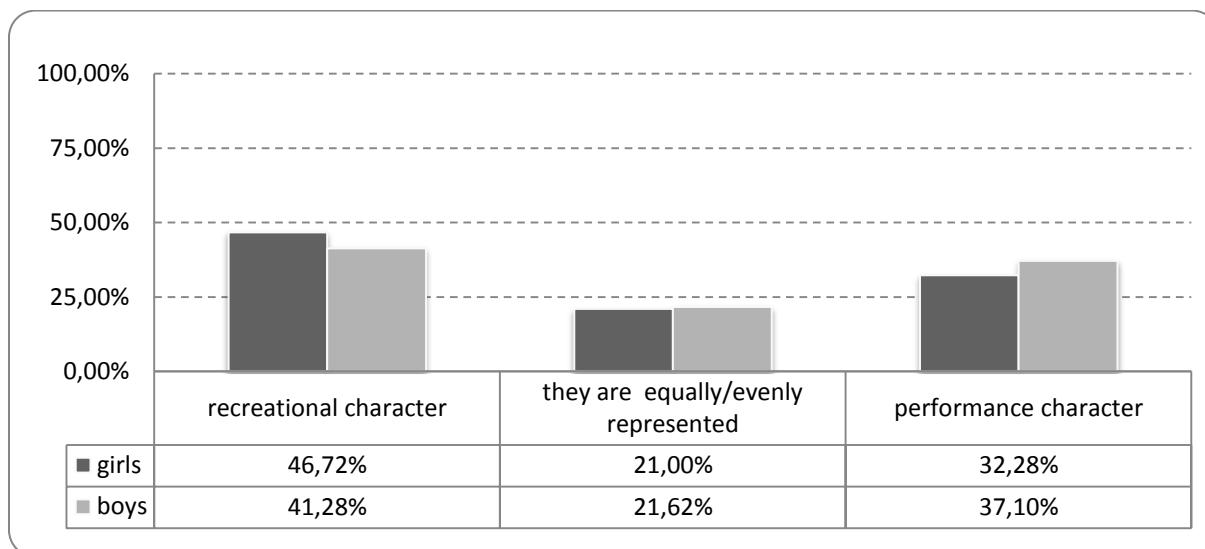
Nemec, Adamčák (2013) in their work mention that the pupils can find teammates and also enemies in a collective games. They can cooperate with them but also they can rival with them. Collective games bring exciting and joyful experiences to them while they experienced stress from struggle but also pretty moments of triumph. Nowadays there are in the foreground many non-traditional sports, which in many cases not require special material equipments and so those sports become the subject of gameplays.

Our findings on the popularity of collective sport games among pupils are in conformity with the work of Bebčáková (1998) in which she investigates the interests of students from the perspective of popularity the physical activities performed either during physical education or in pupils' free time. Alike (similarly), the results of Kubis (2014) confirmed that pupils of the secondary school in the region of Detva ( $n = 224$ ) have a positive attitude to sport and movement games.

The last question that we were interested in what was the character of physical activities elementary school pupils.

In physical activities of pupils predominate activities of recreational character, which are expressed in 46.72% girls and 41.28% boys (Fig. 5). Activities of performance character prefer 32.28% girls and 37.10% boys. The remaining percentages of pupils it means 21.00% girls and 21.62% boys have both activities equally represented. Statistical evaluation of this issue presents Table 4.

Bendíková (2014) in a group of high school students found out that regular sport and recreational activity devote 20% of female students either for recreation or performance level.



Picture 5 Character of movement activities of primary school pupils

Table 4 Statistical evaluation - Character of movement activities of primary school pupils

item	boys ES/girls ES
statistical significance	**
chi – square test	p=0,00014

**Legend:** \*\*= statistical significance - level  $p < 0,01$ , \*= statistical significance - level  $p < 0,05$ , N= statistically insignificant

## CONCLUSION

We think that the results of our research will help at least partially contribute to the improvement of the management and guidance of physical activities of pupils at the existing grade of the school system or it gives to the competent people awareness of that starting problem which is growing and those results will show new possibilities to do more attractive the content of physical education and other subjects which are closely related with physical activities of pupils. We consider that each current knowledge of trends routing of physical

activities and each new research in this area will help us to reveal the current state of physical activities of pupils at secondary stage of elementary school.

In this work we dealt with the issues of how many hours a day during the working week and weekend the pupils devote physical activities. We also monitored the preferred physical activities of pupils and we were interested in nature of physical activities of elementary school pupils. Based on the observed results it can be concluded that current technology time and IT resources and poorly adjusted school system have a significant impact on pupils' interest in physical activity, whether in school or out of school.

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## **POHYBOVÁ AKTIVITA ŽIAKOV DEVIATYCH TRIED ZÁKLADNÝCH ŠKÔL**

### **SÚHRN**

Práca sa zaoberá pohybovými aktivitami 788 žiakov deviatich tried základných škôl vo vybraných mestách z hľadiska intersexuálnych rozdielov. Zistili sme, že 17,78% dievčat a 12,25% chlapcov počas pracovného týždňa realizuje pohybovú aktivitu menej ako 1 hodinu denne. Počas víkendu realizuje pohybovú aktivitu 25,19% dievčat a 15,13% chlapcov. V rámci pohybovej aktivity študentov je dominancia kolektívnych športov oproti individuálnym.

**KEÚČOVÉ SLOVÁ:** pohybová aktivita, žiaci, základná škola

# **IMPACT OF MOTOR PROGRAM ON REMOVING MUSCLE IMBALANCE OF PUPILS AT PRIMARY SCHOOL**

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## **SUMMARY**

The aim of our research was to develop and validate a specific teaching practice program containing motion exercises and yoga exercises on fit ball, and determine its impact on the eradication of muscle imbalance and poor postures with pupils of first grade of primary school. To test the posture we used methods by Klein and Thomas modified by Mayer (1978).

We used five tests for the examination of the muscles with a tendency to weaken (Thurzová, 1992). The evaluation of the postural muscles, we used the test of Janda (1982), modified for the purpose of physical training Thurzova (1992). We have considered eight truncated (postural) muscles.

On average, we observed 35.4% of boys and 42% of girls with weak muscles. When testing posture was observed in the experimental group improved results in the second measurement in both sexes. At the first measurement had 67.5% of boys and 51.4% girls deviation from proper posture. In the second measurement, the occurrence of deviation decreased to 40.9% for boys and 37.1% for girls, significantly at  $p < 0.01$  statistical significance.

Comparing the case of systemic muscle imbalance found, in the experimental group, the improvement between the first and second measurement of 12.6% for males and 18.7% of girls, at the  $p < 0.01$  statistical significance.

**KEY WORDS:** pupils, muscle imbalance, motor program

## **OBJECTIVE**

The focus of physical education in primary education of the dominant target the physical, functional and physical improvement, thereby contributing to the consolidation of health, health-oriented fitness and physical performance. Physical Education provides elementary theoretical and practical training in the field of exercise and sports, it contributes

significantly to the psychological, social and moral development of students, contributing to shaping a positive attitude towards physical activity and also fulfills an important function in the process of compensatory education. Its focus has exceptional physical education and specific role in the education of pupils of younger school age. Mainly it uses a wide spectrum of physical resources that contribute to the overall development of personality with emphasis on gross and fine motor. Through motion - motion exercises, games and competitions positively affects the health status of students. It is well known that the movement, which is one of the key needs of children younger school age, after they entered the school severely restricted. This is evidenced by researches of different authors (Bartosik, 1994 Kopřivová, 1989, Kos, 1985 Krejci, 1996, 1997; Labudová, 1992, 1996), which also highlight the consequences of adaptation of children to hypokinetic mode works in the school, which is manifested by muscle imbalances impaired and thus the posture of the other adverse health consequences.

Bolach (2014), Bolach et al (2009) and Bolach et al (2007) solved the problems of influence on motor program on posture of visually impaired children and young people in Poland.

The aim of our research was to develop and validate a specific teaching practice program containing motion exercises and yoga exercises on fit ball, and determine its impact on the eradication of muscle imbalance and poor postures with students first grade of primary school.

## **METHODOLOGY**

To test the posture we used methods by Klein and Thomas modified by Mayer (1978). The method is suitable in view of the simplicity, modesty and a very good using of different types of posture.

Table 1 Evaluation of posture

<b>Grade</b>	<b>Evaluation</b>	<b>Score (points)</b>
1	very good	5
2	good	6 – 10
3	bad	11 – 15
4	very bad	16 – 20

Based on the criteria Kováčová (2003) and Kanásová (2004) has at one deviation included in the proband groups with an incorrect posture.

### **Method of testing muscle weakness**

We used five tests for the examination of the muscles with a tendency to weaken (Thurzová, 1992).

1. the hip extensors
2. deep digital flexor neck - deep neck flexors
3. abdominal muscles
4. the hip abductors
5. lower blade fixators

### **Testing method of shortened muscles**

The evaluation of the postural muscles, we used the test of Janda (1982), modified for the purpose of physical training Thurzova (1992).

We have considered eight truncated (postural) muscles

1. the three-headed calf muscle - m. triceps surae
2. straight thigh muscle - m. rectus femoris
3. flexor knee joint - the knee joint flexors
4. adductor hip - the hip adductors
5. lumbar quadriceps muscle - m. quadratus lumborum
6. erector spine - m. tensor fascia late
7. pectoralis muscle - m. pectoralis major
8. trapezius, upper - m. trapezius pars superior

### **Method of pedagogical experiment**

In this work we used a confirmation (verification), single-factor experiment in natural conditions in the technique of two parallel groups.

We have realized it at the elementary school Dr. D. Fischer in Kežmarok. It was attended by 58 students of the fourth grade. In the experimental group, in which we have established an experimental factor were 30 students in the control group of 28 students.

Our experimental factor was a set of yoga exercises and a set of exercises on fit ball.



## RESULTS AND DISCUSSION

When assessing the quality of posture we included subjects in three stages, as in the fourth stage (poor posture) are in the experimental or control group has not been any boy or girl. The results of evaluation of the quality posture of both groups of the first and second measurement subjects are documented in Table 2. The overall assessment is that, as in the evaluation of the components of muscle imbalance, the quality of posture retains a high incidence of deviations from proper posture. In the first step (the excellent DC) is the low rate of moving subjects in the range of 14.3% to 25% of males and 7.1% - 21.4% of girls. We record the highest percentage of second degree (boys 68.8% - 85.7%, girls 78.6% - 85.7%). When results comparison with Kováčová (2003), which records the total incidence of incorrect posture in the range of 91% to 100% of children and our research (85.7% - 100%) appears to us this urgent problem, however, is within the body of teachers education influence him in favor of children population. When analyzing the results again notes the positive impact of targeted exercise and the muscular imbalance as well as the quality of posture.

The boys in the experimental group recorded a positive change impact exercises to postural stereotype (posture) when compared to the first measurement improved in the first instance 25% of girls and 14.3%, improvement is significant at  $p < 0.01$  level of significance.

In the second phase (DT good) to stable values among boys (68.8%) of both measurements. The girls had an improvement of 7.1% ( $p < 0.05$ ), as well as the third step. At the first measurement was diagnosed 31.3% of boys in third grade and beyond, at the second measuring only 6.3% (an improvement of 25%).

For significance to the improvement in the 1% level significantly. The development of posture in the control subjects showed a deterioration compared to the first measurement, the transfer of children from first to second stage a further step 3, which is bad posture. At the first measurement was 14.3% of boys and 7.1% girls with perfect posture and leaving this phenomenon spontaneous physiological development of the first stage at the second testing finds no proband control group. Based on the shift to a lower degree recorded a percentage increase from the original 78.6% to 85.7% in the second degree and third degree 14.3% of boys reported bad posture. Both regressive shifts are significant ( $p < 0.05$ ). The girls are at the second testing reduced the percentage of appearance in the second stage of the 7.14% and bad posture was recorded in 21.4% of girls at the  $p < 0.01$  statistical significance

Table 2 Quality posture of pupils by degrees

Quality	%	EG – boys		KG - boys		EG - girls		KG - girls	
		M1	M2	M1	M2	M1	M2	M1	M2
<b>1.very good</b>	%	<b>0</b>	<b>25,0 **</b>	<b>14,29</b>	<b>0 **</b>	<b>7,14</b>	<b>21,43**</b>	<b>7,14</b>	<b>0 *</b>
<b>2. good</b>	%	<b>68,75</b>	<b>68,75</b>	<b>78,57</b>	<b>85,71 *</b>	<b>85,71</b>	<b>78,57</b>	<b>85,71</b>	<b>78,57</b>
<b>3. bad</b>	%	<b>31,25</b>	<b>6,25 **</b>	<b>7,14</b>	<b>14,29 *</b>	<b>7,14</b>	<b>0 *</b>	<b>7,14</b>	<b>21,43**</b>

Changes in incidence of overall muscle imbalance was recorded based on the occurrence of deviations from the norm in the three basic components of muscle imbalances - shortened muscles, weakened muscles and movement patterns that we have in previous chapters distributed in four quality grades by Kováčová (2003). Generalized muscle imbalances were determined by summary tables when the prevailing level of the three components of muscle imbalance has been a defining subjects for inclusion into quality grades I - IV. overall muscle imbalances.

The first step is a qualitative muscle balance, and in him we both reference file at the second measurement occurred in 14.3% of girls in the experimental group. This shift attach a targeted workout that was in ES between the first and second measurement. In the fourth grades that is generalized muscle imbalance to us in the same way as the first level probands occurred sporadically. In the experimental group during the first measurement, it was 6.3% of boys, but the types of measurements, the effect of exercise improved in zero. In the control group, which conducted the standard physical education lessons we at the second measurement in girls (7.1%) had worsening. Our results correlate with the view Janda (1996), for the spontaneous evolution is characterized by muscle imbalance increase with age. Changes in total muscles were assessed in both groups studied in children under the distribution II. and III. grade, the probands which occur most frequently. In the experimental group by deliberately influencing the pupils in a targeted exercise during

the experiment are designed to correct functional motor system, we have found in the case of systemic improving muscle imbalance between the first and second measurement equal by both boys and girls  $p < 0.01$  (Table 3 and 4). The results point to an effective impact exercise program, where there has been a significant improvement in overall muscle imbalance, thus increase the distribution of subjects in II. qualitative band (light level SN). In boys, this increase is 37.6% significantly  $p < 0.01\%$ , a product of the number of boys II. qualitative level compared to the first measurement. In girls we note also improve the results when the first measurements were in the second. Step 28.6%, the types of measurements that was significantly, 64.3%  $P < 0.01\%$ . Depending on the number of subjects in the increased II. the degree of decreased distribution in III. qualitative stage in boys 31.3% and girls 50% level of significance at  $p < 0.01\%$ . Our results correspond with the results of research Kováčovej (2003) and Kanášová (2004), which also saw a shift from the intermediate (III.) The degree of overall muscle imbalance in mild (II. Qualitative level) significantly. In terms of sexual dimorphism also we state compliance with the author and that the first measurement is less boys (62.5%) than girls (71.4%) were situated in the III. qualitative band  $p < 0.05\%$ . In the second measurement stated above distribution of boys (31.2%) than girls (21.4%), which, however, we showed statistical significance in terms of gender. Higher values in the second. qualitative range (boys 68.8%, girls 64.3%)  $p < 0.01\%$  for the second measurement attribute to the positive impact of targeted exercise program, which ran in the experimental group between the first and second measurement subjects. Comparing the results overall muscle imbalance in the control group recorded a significant deterioration - increase in the number of subjects III. qualitative stage in both sexes significantly  $p < 0.01\%$ . At the first measurement was the III. qualitative level 71.9% of boys and 50% girls at the second 92.9% of boys and 78.6% girls. In II. qualitative Gaza there was a decrease in boys from 28.6% to 7.1% and in girls was a decrease of 50% from the first measurement to 14.3% - in both sexes significantly 0.01%. Changes in the distribution of students in a particular grade point to a positive impact of targeted content within physical education for both sexes. In the control group, which participated during the standard physical education classes we have seen a shift in subjects III. qualitative degree of overall muscle imbalances and for girls (7.1%) and in IV. Instance, which is generalized muscle imbalance. We agree with Kováčová (2003), our results have certain limitations, but presents us some input on general muscular imbalance, which is not in our population of children of that age periods studied systematically. At the same time, however, our results point to the possibility of preventive action mandatory forms of physical

education activities to prevent muscle imbalance, regular exercise and strengthening the habit of proper posture (Tables 3 and 4).

Table 3 Changes in rates of overall boys muscle imbalances by quality grades

Quality grades	Perc.	EG – boys		chí – square	KG - boys		chí – square
		M1	M2		M1	M2	
I. muscle balance	%	0	0	–	0	0	
II.light level of muscle imbalance	%	31,2	68,8	0,01315 **	28,6	7,1	0,01568 **
III.medium level of muscle imbalance	%	62,5	31,2	0,01454 **	71,4	92,9	0,01882 **
IV.generalized muscle imbalance	%	6,3	0		0	0	

Table 4 Changes in rates of overall muscle imbalances by quality grades – girls

Quality grades	Perc.	EG - girls		chí – square	KG - girls		chí– square
		M1	M2		M1	M2	
I. muscle balance	%	0	14,3	0,01928 **	0	0	
II.light level of muscle imbalance	%	28,6	64,3	0,01267 **	50,0	14,3	0,01324 **
III.medium level of muscle imbalance	%	71,4	21,4	0,01172 **	50,0	78,6	0,01882 **
IV.generalized muscle imbalance	%	0	0	–	0	7,1	0,04315 *

## CONCLUSION

We in the research based on the following assumptions:

H1: We assumed that over 50% of subjects determine the prevalence of functional disorders of the supporting - motor system reflecting the deviations from proper posture. Hypothesis 1, we confirmed as measured by the method of Klein and Thomas modified Mayer our results showed that 58.8% of boys and 55% of girls in a variation in the quality of body posture. When testing the shortened muscles, our findings confirm existing knowledge of dominance ischiocrural muscles. Their incidence in boys stood in the experimental group value of 75% in the control group 75.4%. The girls in both groups equally 71.4%. Initial step referred to the fact that the incidence of shortened muscles higher in boys than in girls. On average, eight muscle testing with a tendency for shortening was diagnosed 53.9% of boys and 49.5% girls with shortened muscles. The most frequent occurrence in diagnosing muscle weakness has shown us the value of the hip extensors. The boys in the experimental group it was 56.3% and 64.3% of girls. In the control group testing, we found 57.1% of boys (girls

64.3%) weakened hip extensor. On average, we observed 35.4% of boys and 42% of girls with weak muscles.

H2: In the second hypothesis, we assumed that due to intersexual differences show up in tests higher incidence of shortened muscles in boys and muscle weakness in girls. When comparison results with regard to sexual dimorphism confirmation we state the hypothesis. When diagnosing shortened muscles we observed in boys 53.9% and girls 49.5% of shortened muscles. This may be caused by Adamčák (2007) pronounced reaction postural muscle boys static load, the natural more interested in strength exercises, as well as the actual selection of special-interest physical activity. On examination weakened muscles we note a higher incidence in girls (42%) than boys (35.3%).

H3: We assumed that after the introduction of an experimental agent that have been set yoga exercises and exercises to fitballs record a positive change in the quality of posture and reduce the incidence of muscle imbalance. When testing posture was observed in the experimental group improved results in the second measurement in both sexes. At the first measurement had 67.5% of boys and 51.4% girls deviation from proper posture.

In the second measurement, the occurrence of deviation decreased to 40.9% for boys and 37.1% for girls, significantly at  $p < 0.01$  statistical significance. Comparing the case of systemic muscle imbalance found, in the experimental group, the improvement between the first and second measurement of 12.6% for males and 18.7% of girls, at the  $p < 0.01$  statistical significance.

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## **VPLYV POHYBOVÝCH PROGRAMOM NA ODSTRANOVANIE SVALOVÝCH DYSBALANCIÍ ŽIAKOV NA ZÁKLADNEJ ŠKOLE**

### **SÚHRN**

Cieľom výskumu bolo vytvoriť a overiť v konkrétnej pedagogickej praxi na základnej škole vplyv pohybového programu s obsahom jogových cvičení a cvičení na fit loptách na redukcii svalovej nerovnováhy a na zlepšenie držania tela žiakov a žiačok na 1. stupni základnej školy v Kežmarku. Hodnotenie držania tela sme realizovali pomocou metódy Kleina a Thomasa modifikovaná Mayerom (1978).

Použili sme 5 testov na hodnotenie oslabených svalov a 8 testov na hodnotenie posturálnych svalov podľa Jandu (1982). Uvedené testy modifikovala pre potreby školskej telesnej výchovy Thurzová (1992).

Zistili sme, že 35.4% chlapcov a 42% dievčat malo oslabené svaly. Pri hodnotení držania tela sme zistili, že pri vstupnom meraní malo 67.5% chlapcov a 51.4% dievčat odchylky od správneho držania tela.

Pri výstupnom meraní po absolvovaní pedagogického experimentu sme zistili zlepšenie v úrovni držania tela nasledovne: 40.9% chlapcov a 37.1% dievčat malo nesprávne držanie tela. Išlo o zlepšenie na 1% hladine štatistickej významnosti.

**KLÚČOVÉ SLOVÁ:** žiaci, svalová nerovnováha, pohybový program

# **ANALYSIS AND COMPARISON OF THAI BOX TRAINING PROGRAMMES IN SLOVAKIA**

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## **SUMMARY**

The aim of the work was to observe and compare the training programmes of several Thai boxing clubs in Slovakia and the creation of the optimal form of the training records in which the sportsmen are able to note down their course of preparation for the competition. In this article we focus on the data we have acquired through a training diary made by ourselves. Then we compared and evaluated them according to the results of the competition. We found out that the highest average amount of training pressure (312 min) is in the third week of the preparation. Sparring had the highest average contribution in the structure of a training unit (19,37%). At the end we have used the method of discussion to discover what the reaction of sportsmen to the training recording was, what they would change and on the ground of these data we created a new training record which could be used in training praxis.

**KEY WORDS:** Club, Competitive period, Thai box, Training diary.

## **INTRODUCTION**

Thai boxing is a more than one thousand years old martial art that came across a great change after the World War II. In those times the old martial art altered to an attractive ring sport and nowadays it is actively practised by lots of people for self-defence or sport purposes (Rebac, 2011).

Thai boxing is a challenging sport that demands both physical condition and coordination. The basic movement assumptions are the high functionality of the vestibular apparatus and the dynamic strength of the muscles of the upper and lower limbs and torso. From the physiological point of view, this sport demands intensive energy consumption (Bartik, Sližik, Reguli, 2007).

Thai boxing is characterised by a high intensity of punches and kicks. In this activity there are activated fast glycolytic muscle fibers which results in the production of lactate. From the speed capabilities apply especially speed of action, acceleration and frequency when



the main aim is to carry out the strokes as soon as possible. The development of the condition capabilities is as important as the development of the coordination capabilities. One applies above all the kinaesthetic - differentiating capabilities (precise strikes or kicks, timing of strikes), temporal and spatial orientation (the coordination of movement and their change in accordance with the movement of an opponent), static and dynamic balance (rapid change of the positions), rhythmic ability, reaction ability - the selection of the optimal solution in a short period of time and its realisation (Zemková a kolektiv, 2006).

Intellectual development is a systematic expansion of knowledge and experience. A broad base of knowledge accelerates and improves the creation and usage of knowledge (Starší, Jančoková, 2001).

The development of the intellect in the preparation in Thai boxing is watching matches in the same as well as higher performance category and analysing particular actions. It is also important to observe own matches on videotape.

Choutka, Dovalil (1987) divide the components of sports training into physical condition, technical, tactical and psychological preparation. They also state that the closest relations between the individual components may be for example in the martial arts, where they merge into each other. This applies primarily to technical and tactical training.

Preparation in Thai boxing was initially focused primarily on the physical condition, the development and consolidation of the physical condition and coordination abilities and also to learn, adopt and carry out the technique properly. As the time passes, an increasing emphasis is put on the technical side and according to Dovalil (2010), the extraordinary demands are placed on choosing alternative technique and its adaptation to a difficult situation, whereby this is often done under time pressure.

Dovalil (2012) indicates that the cycle in the sport means a relatively completed series of the recurring time intervals of different lengths in the training process. According to the length one divides the training cycles into microcycles (short-term, multi-day cycle), mesocycles (medium, multi-week cycle) and macrocycles (takes several months to years).

The training unit is the shortest element and the major organization form. The training unit in thai box takes generally 90 minutes, great attention is paid to the introductory part to prepare the sportsman physically and mentally for the next action. The emphasis is mainly put on a warm-up activities which typically takes 15 to 30 minutes and dynamic or static stretching. The main part of the training unit is dedicated to the development and consolidation of technical and tactical skills (sparring, using kicking pads, shadow training, clinch, practising techniques in pairs or with the bag), development of strength, speed,

endurance capabilities. Various strengthening exercises, circuit trainings and tabata are often included within the main part of the training unit. Individual stretching usually takes place in the final part of the training.

## **AIM**

The aim of our survey was to obtain information about the structure and content of sports training of the competitors in the Thai boxing in some selected clubs in Slovakia. Consequently we analysed and compared the acquired information. The sub-aim of our work was to develop specific training diary to record sports training in Thai boxing.

## **METHODOLOGY**

The group which we monitor consists of 10 males and one female person from different Muay Thai clubs in Slovakia aged 15 to 30 years. Individuals are active wrestlers in amateur Muay Thai Euroleague competition, or compete in commercial competition with professional nature. 8 subjects can be classified in the amateur category "D" (a three round fight / two minutes each, with elbow guards, leggings and helmets) and three in the professional category "C" (a three round fight / two minutes each, without elbow guards and helmets, bare legs).

The survey was conducted in cooperation with eleven Slovak clubs of Thai boxing. They are: Fightclub Slovakia Brezno, Erawan gym Banská Bystrica, Firegym Banská Bystrica, Power Gym Zvolen, Goral Gym Kežmarok, Oktan Gym Predajná, Clinching Boxers Gym Bratislava, Hanuman Gym Bratislava, Diamond Gym Žilina, Cerberos Gym Nové Mesto nad Váhom, CBS Trnava . In each of these clubs the monitored sportsmen kept their training records.

Each wrestler completed their diary separately, depending on how and when they trained. After the handover of the records, the sportsmen were asked a few brief questions and answers were recorded on the answer sheet. Thereafter we observed the fight of every monitored sportsman personally or on videotape.

Due to the fact that in practice of this sport there is absence of any form of standard training record, we created our own training record to fulfill the needs of our survey. We analysed the records according to the achieved results in the competition.

After obtaining the records we had an individual non-standard conversation with every sportsman involved. The questions were prepared in advance and had open character. We asked them about their opinion, how the work with the diary was, whether it was complicated, what they would change and if they would like to continue in keeping the diary.

Training records were evaluated according to the quantitative point of view this way: First, we evaluated the training record of each proband monitored separately. We recorded the duration of the training units of Thai boxing in each microcycle and within each training session we recorded duration of these exercises - sparing, clinch, kicking pads, bag, shadow training, training techniques in pairs. Subsequently, we totalized the collected data about every microcycle and all the probands and the result we got was averaged.

## RESULTS

The average age of subjects in the study group is 22.5 years, the youngest proband is 15 years old and the oldest one 30 years old. The average body height of the subjects in the study group is 177.54 cm, the lowest proband measures 163 cm and the highest proband measures 199 cm. The average weight of subjects in the study group is 72.54 kg, subjects with the lowest weight weights 61 kg, the proband with the maximum weight weights 89 kg. The data about weight are considered to be important not only from the competitive point of view (insertion into a particular category according to weight), but also from the long-term point of view where the unsteady weight could indicate health problems. The average BMI of subjects in the study group is 22.95 units, the probandt with the lowest BMI index has 21.7 units and the proband with the highest BMI index hass 25.7 units. Somatometric characteristics are given in Table 1 and training and contest balance in Table 2.

Table 1 Somatometric characteristics

<b>Proband</b>	<b>age</b>	<b>height (cm)</b>	<b>weight (kg)</b>	<b>BMI</b>
<b>1</b>	24	183	75	22,4
<b>2</b>	17	199	89	22,5
<b>3</b>	26	165	61	22,4
<b>4</b>	15	163	58	21,8
<b>5</b>	27	184	87	25,7
<b>6</b>	30	175	69	22,5
<b>7</b>	23	177	73	23,3
<b>8</b>	22	181	71	21,7
<b>9</b>	24	175	70	22,9
<b>10</b>	21	169	71	24,9
<b>11</b>	19	182	74	22,3
<b>Average</b>	22,5	177,54	72,54	22,95

Table 2 Training and contest balance

<b>Proband</b>	<b>Years in training</b>	<b>Number of contests</b>	<b>Victories</b>	<b>Defeats</b>	<b>Draws</b>
<b>1</b>	3	7	5	2	0
<b>2</b>	2	11	10	1	0
<b>3</b>	2	16	4	9	3
<b>4</b>	1	1	0	0	1
<b>5</b>	2	9	3	6	0
<b>6</b>	9	45	25	15	5
<b>7</b>	5	3	2	1	0
<b>8</b>	5	11	3	3	5
<b>9</b>	6	20	15	3	2
<b>10</b>	2	4	2	1	1
<b>11</b>	2	5	4	1	0
<b>Average</b>	3,5	12	7	4	2

The average number of years spent in training of subjects in the study group is 3.5 years, the shortest recorded period of training is 1 year and the longest recorded period of training is 9 years. The average number of matches of the subjects in the study group is 12, the lowest number of matches is 1 and the maximum number of matches is 45. The average number of wins of the subjects in the study group is 7, the lowest number of wins in the group is 0 and the highest is 25. The average number of losses of the subjects in the study group is below the average number of wins - 4, whereby the lowest number of losses is 0 and the highest number of losses is 15. Average number of draws of the subjects in the study group is 2, the lowest number is 0 and the highest number is 5.

The following table (Table 3) presents an example of training pressure, structure of Thai boxing training units in terms of the most common exercises and the amount of recovery for all subjects during the microcycle when preparing for a match. The data are represented in minutes and each exercise are also expressed as a percentage. Under the title "Other" were included warming up activities, static stretching, dynamic stretching, all strengthening exercises which are included in the workout, pauses between exercises, circuit trainings and tabata trainings.

Table 3 Selected Indicators of training pressure in Thai Box training by proband YX

M	Selected exercises															
	T	Sparring		Clinch		Kicking pads		Bag		Shadow training		Tech		Other		RR
	min	min	%	min	%	min	%	min	%	min	%	min	%	min	%	min
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	270	90	33,4	0	0	35	13	70	25,9	18	6,7	0	0	67	24,8	60
3	270	84	31,1	20	7,4	30	11,1	40	14,8	18	6,7	0	0	78	28,9	60
4	270	35	13	0	0	72	26,7	80	29,6	18	6,7	0	0	65	24,1	60
5	270	0	0	20	7,4	45	16,7	80	29,6	27	10	0	0	98	36,3	60

M – microcycles, T – amount of training pressure, Tech – techniques, R – regeneration

Proband YX devoted themselves to specialized training for the match from 2nd to 5th week, the amount of training pressure was the same in all microcycles. Sparring reached the highest percentage of the selected exercises in the second week (33.4%), sparring again in the third week (31.1%), techniques with the bag in the fourth week (29.6%) and techniques with the bag again in the fifth week (29,62%). There was always time for regeneration during the whole training which had a positive impact on the proband mentally and physically and reflected on the course and result of the contest. During the first 30 seconds of the first round the opponent received a series of blows to the face and the contest ended up with KO blow to the chin.

The following Table 4 reflects the amount of training pressure for all subjects in every microcycle and the average recovery time. The highest average amount of training pressure was in the third week and the lowest one in the first week. The amount of regeneration was highest in the fourth week of preparation. The values highlighted in green represent the lowest proportion and values highlighted in red the highest proportion of the chosen exercises within the microcycle. Sparring has the largest representation in the structure of training units (19.37% - the highest contribution). A high representation is also under the term "other", where strenghtening training, fitness exercises and breaks between rounds are included. The highest proportion was recorded in the fifth week of preparation.

Table 4 The average amount of training pressure in microcycles

<b>MICROCYCLE</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>time T (min)</b>	<b>101</b>	191	<b>312</b>	299	183
<b>Sparing (min)</b>	10	37	44	45	14
<b>%</b>	9,9	<b>19,37</b>	14,1	15,05	<b>7,65</b>
<b>Clinch (min)</b>	5,45	7,91	25,81	11,1	8
<b>%</b>	5,4	4,14	<b>8,27</b>	<b>3,71</b>	4,37
<b>Kicking pads (min)</b>	7,18	18	27,72	36,81	22,5
<b>%</b>	<b>7,1</b>	9,42	8,88	<b>12,3</b>	<b>12,3</b>
<b>Bag (min)</b>	14,1	28	34,27	42,81	27,7
<b>%</b>	13,96	14,66	<b>10,98</b>	14,31	<b>15,14</b>
<b>Shadow t. (min)</b>	14,8	17,45	15,27	10,1	6
<b>%</b>	<b>14,65</b>	9,13	4,89	3,38	<b>3,28</b>
<b>Techniques (min)</b>	0	0	2,72	2,72	2,3
<b>%</b>	<b>0</b>	<b>0</b>	0,87	0,91	<b>1,25</b>
<b>Other</b>	49,47	82,64	162,21	150,55	102,5
<b>%</b>	48,98	<b>43,26</b>	52	50,35	<b>56</b>
<b>Regeneration (min)</b>	<b>6,36</b>	11,83	18,81	<b>34,55</b>	18,17

To ensure feedback, we led a short, non-standardized, individual interview with the previously prepared five questions. The answers were noted down on the answer sheet and the data collected were evaluated as follows:

81.8% of the probands answered the first question ‘How was the work with the training diary’ positively. They had no problem with completing their progress. 18.2% of the probands said that according to them, completing the diary was a waste of time. We also recorded that using the diary was motivation for training activities.

The second question ‘Whether the training diary and its completing was clear or difficult’ was answered as follows: 72.7% of probands had no difficulties, 27.3% of probands experienced some problems and therefore did not complete the diary according to the instructions. The problematic point were the data about nutrition.

The question 3 'How much time did it take to fill in the diary per day' was answered: 45.4% - 10 minutes, 36.4% - 15 minutes, 9.1% - 20 minutes, 9.1% - were not able to state the time.

The question 4 was 'What would you change in the training diary'. 36.4 % of probands could not express themselves, they were satisfied with the current form of the diary. 36.4% of the probands said that they would need more space for the information about nutrition. 27.3% of the probands required more space for the information about training unit. We also recorded an opinion that it could be appropriate to use more colours in the diary.

54.5% of the probands answered the fifth question 'Would you like to continue in filling the diary' positively, 18.2% of the probands gave negative responses and 27.3% of the probands were unable to decide.

## **CONCLUSION**

The objective of our survey was to obtain information about the structure and content of sports training of competitors in the Thai boxing in selected clubs in Slovakia and sequentially analyse them and compare them with each other.

We found that the greatest differences between Thai Boxing clubs are quantitative indicators of the amount of training pressure. The duration and the amount of training pressure varied in each case. In almost all cases the pressure continued to grow gradually and peaked in the fourth week of preparation. In most cases Thai boxing training was not the only thing that was included in the preparation. Training in a gym, athletic training to develop stamina, to a lesser extent training in swimming pool or other martial arts training were also present. The structure of the training of Thai boxing was in every club different, but we also found the common features - the majority of subjects excluded sparing and clinch in the final week of preparation before the competition (injury prevention), in nine cases, the amount of training pressure decreased compared to previous weeks (regeneration, rest before the contest).

We found out that the amount of training pressure and recovery affect the performance of sportsman at the competition individually. The sportsman had problems to succeed at a high training pressure, as well as when the training pressure was too low. In a match, however, an important factor is also the actual psychological state of the sportsman which can largely affect the whole course of the match and the result.

We found out that 81% of the probands expressed themselves positively in relation to the training diary and 54.5% would like to continue in filling the diary. 72.7% of the probands had no difficulties with filling the diary. The majority of the probands found the filling of the diary as a new and enriching experience.

The stated objective of our work was accomplished. We analysed the amount of training pressure and the structure of Thai boxing training from the 11 acquired records during the contest period. The obtained data were processed, analysed and compared with each other.

We searched for cross-correlation with sports performance in the competition.

As a result of the fact that there is no training record in any form for martial arts, we established such a record for our needs as well as for praxis which was directly in practice during the preparation for Thai boxing contests. For consistency, we had to create the instructions how the training diary should be filled in. 81% of the probands found the diary as a positive contribution and 54.5% of the probands would like to continue in using the diary. The opinions of sportsmen in relation to the diary were largely positive. They gave us interesting thoughts which we considered and created an enhanced version of the training diary.

### **Recommendation for praxis**

Our training record tested in practice is applicable not only in Thai boxing but also in other martial arts. We think that its use in everyday training praxis could be beneficial by enabling simple and transparent recording. As a result of that the preparation of the sportsmen could be more effective from the point of view of sports preparation, planning a new activity and comparing particular cycles in the preparation. The information about the sportsmen would be arranged, transparent and easily accessible for the trainer.

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## APPENDIX 1

[illegible]

## **ANALÝZA A POROVNANIE TRÉNINGOVÝCH PROGRAMOV THAJSKÉHO BOXU NA SLOVENSKU**

### **SÚHRN**

Cieľom práce bolo zaznamenať a porovnať tréningové programy v súťažnom období vo viacerých kluboch thajského boxu na Slovensku. Ako čiastkový cieľ sme si stanovili tvorbu optimálnej podoby tréningového záznamu, do ktorého si športovci môžu značiť priebeh svojej prípravy na súťaž. V príspevku sa venujeme údajom, ktoré sme získali prostredníctvom nami vytvoreného tréningového denníka, porovnávame ich a vyhodnocujeme vzhľadom na výsledok v súťaži. Zistili sme, že najvyšší priemerný objem tréningového zaťaženia (312 min) je v treťom týždni prípravy. Celkovo najvyšší priemerný podiel v štruktúre cvičení tréningovej jednotky mal sparing (19,37%). Na záver sme ešte metódou rozhovoru zistili, aký ohlas mal tréningový záznam u športovcov, čo by zmenili a na základe týchto údajov sme vytvorili nový tréningový záznam, ktorý by sa mohol uplatniť v tréningovej praxi.

**KEĽÚČOVÉ SLOVÁ:** Klub, Súťažné obdobie, Thajský box, Tréningový záznam.

## **PHYSICAL ACTIVITIES IN THEIR FREE TIME SECONDARY SCHOOL STUDENTS**

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### **SUMMARY**

The aim of our research was to find out and analyze opinions secondary students in Humenne physical activities in their way of life. Research was conducted at three secondary schools in Humenne. Research group consisted of students of the second, third and fourth grade at age 16-19 years. Questionnaire for secondary school pupils – questions divided into categories focusing on detection history data, leisure and sport physical activity. 32.24 % of students indicated that their leisure time within a working week performing physical activity.

**KEY WORDS:** physical activity, leisure time, high school students.

### **INTRODUCTION**

Leisure is one of the basic human rights regardless of gender, age, race, sexual orientation, health status or economic status.

Pávková et al. (2008) understands leisure as part of human life that we do out of working time and include there the physiological needs of the individual, family care and children and other obligations. Kratochvílová (2004) sees leisure as a unique and important part of the lives of children, youth and adults - a man at any age.

Nowadays, when we are surrounded from each side by media is very hard to find free time for regeneration and relaxation. Adults free time often affects work, but on the other hand, children and young people can not spend their leisure time actively, which is why there is an increase of socio-pathological phenomena. To make children and young people spend their free time actively, has a major impact not only the family but also school. One of the best and most interesting ways to spend a free time is hiking. The sports activity also belongs to one of the fundamental physical culture, resp. the importance of sport in physical activities (Židek et al., 2004).

Leisure is one of the basic human rights regardless of gender, age, race, sexual orientation, health status or economic status.

We understand it as the opposite of compulsory work or duty, so we understand it by non-working part of the time which is left for to carry out the necessary activities (sleeping, eating, traveling to work, housework, etc.). The term free time we imagine deserved rest, recreation, leisure activity that enriches us both mentally and physically, entertainment, travel, exploring the landscape, spend time with friends and family.

Free time belongs to concept which are not easily definable. Many sociologists consider leisure as a certain part of time of each individual, others regard it as a quality of experience that is not limited by exact time.

In the literature we can meet with those of several authors who express their opinions and attitudes to leisure time. One of the is Spousta et al. (1994), who defines leisure as huge value and infinite value of every individual to return to himself, to his own life, to think about the values and be able to realize their vulnerability to a massive effort to save them. Later authors Masariková and Masarik (2002) reported that leisure time is the space where the person can develop and deal with their freedom of action, time to recover and relax and implement their own interests. In contrast to other authors, Kominarec (2003) sees the free time from positive and negative side. From a positive point of view he describes it as the time that the individual organizes it according to their needs. From negative side he considers it as time which is left for, if he fulfill all the duties. What is important is how the concept of free time sees each of us, for example. If someone consider as a leisure visiting relatives, others consider it as an obligation. Krystoň (2003), also deal with this issue he sees leisure time as the whole time used for yourself, your needs and no matter what type of activity we chose.

Regular exercise and sports activity in total has a profound impact on our physical and mental health. Movements in humans improve blood circulation, strengthens the muscle mass, exercise also helps to increase immunity and not least contribute to a better mood. Exercise and movement is an appropriate means to reduce weight, maintain joint mobility, has a positive impact in cardiovascular diseases and many others (Krafčík – Görner, 2013).

In given area it is an important place to spend free time and dedication hobbies, such as, hunting, fishing, camping (Görner – Pyšný – Kompán, 2007).

Adamčák – Nemec (2011), Hřčka (2000), Kolofík (2015) and Oborný – Kotyra (2008) reported that a well-conducted physical activity leads to human health and has a positive effect on the body. Bendíková (2012), states that the basis for any physical activity is primarily a movement which relates to individual's expression of feelings, its moods, needs,

and also with communication capabilities of each person. Görner – Kompán (2008) Mikoško (2006) divide physical activity in nature to: Outdoor activities, Outdoor Sports – called, so-called "Survival", Physical activities relating to the implementation of other activities.

## AIM

The aim of our research was to find out and analyze opinions secondary students in Humenne physical activities in the countryside in their way of life. Research carried out within the VEGA 1/0758/14 "The intervention of playful activities to change attitudes of students to physical education"

## METHODOLOGY

Research was conducted at three secondary schools in Humenne: Grammar school arm. gen. L. Svobodu, business college and secondary vocational school. Research group consisted of students of the second, third and fourth grade at age 16-19 years. On the research it participated 531 students, including 236 boys and 295 girls. 217 students from high school, 143 pupils the business academy and 171 students from secondary vocational schools (Fig.1,2).

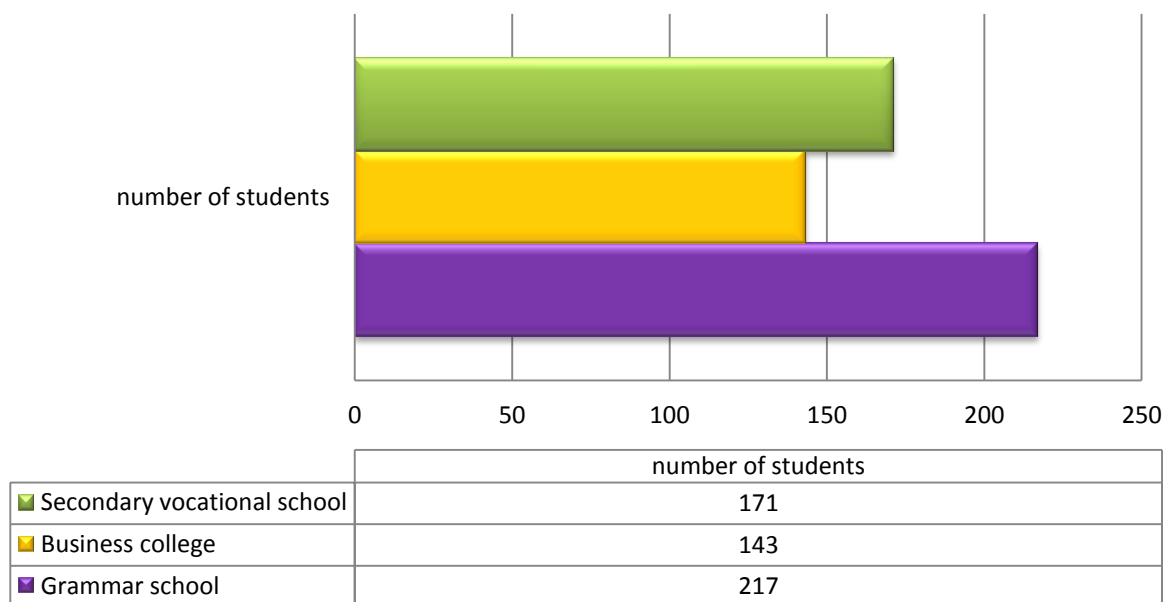


Figure 1: Distribution of respondents by school

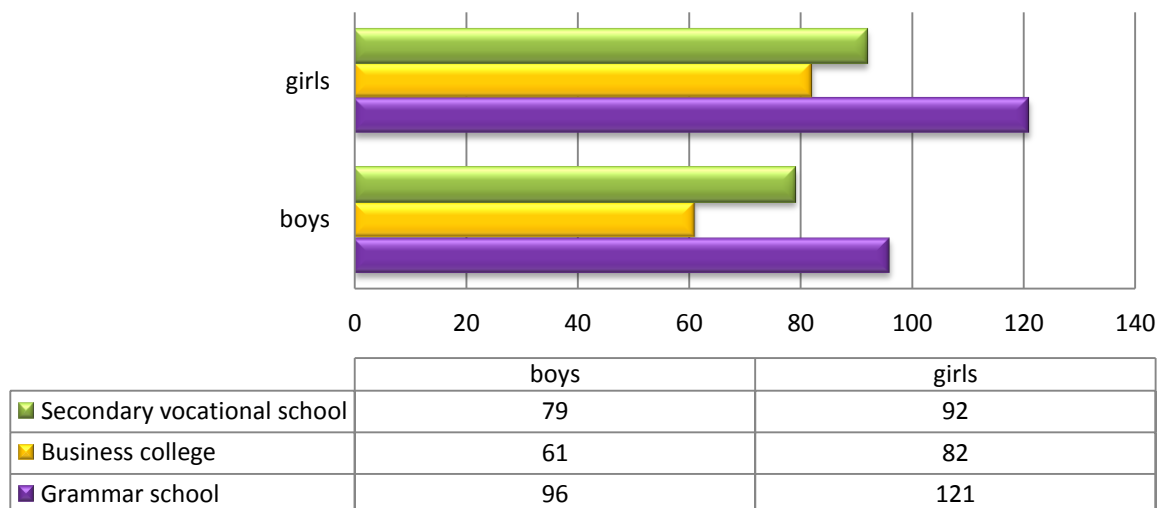


Figure 2 Breakdown of respondents by education and sex

Research was realized in the months of March, April, May and June 2015th. We visited selected secondary schools where you are in agreement with the school directors familiarize teachers of physical education and sports research and their help, we implemented research on tourism and sports and physical activity in the countryside way of life secondary school pupils.

Questionnaire method we decided to use the best way of obtaining the information needed for research. *Questionnaire for secondary school pupils* – included 33 questions divided into categories focusing on detection history data, leisure, hiking and sport physical activity. Questions in the questionnaire were mostly closed, where respondents could choose any of the offered answers.

## RESULTS AND DISCUSSION

In the first part of our research we aimed to determine the health status of the respondents, as the health status plays an important role in the implementation various sports activities and tourism (Fig. 3a). Health students have several options to pay attention to sports activity, they are not restricted to movement, but also the environment where the activity is carried out, which, however can not be said about those who have serious health problems because you have to choose the activity already depending on where is carried out if it is not in any litter the area, for example, problems with the respiratory system and so on. From the observed results, we can conclude that almost half of respondents considered himself as completely healthy but 17 % as for the sick.

Many authors report that students who come from rural areas are generally healthier than those who come from the city. This argument also interested us, and after evaluating student achievement in urban and rural areas we found to be true, although the differences are not very large (Fig. 3b).

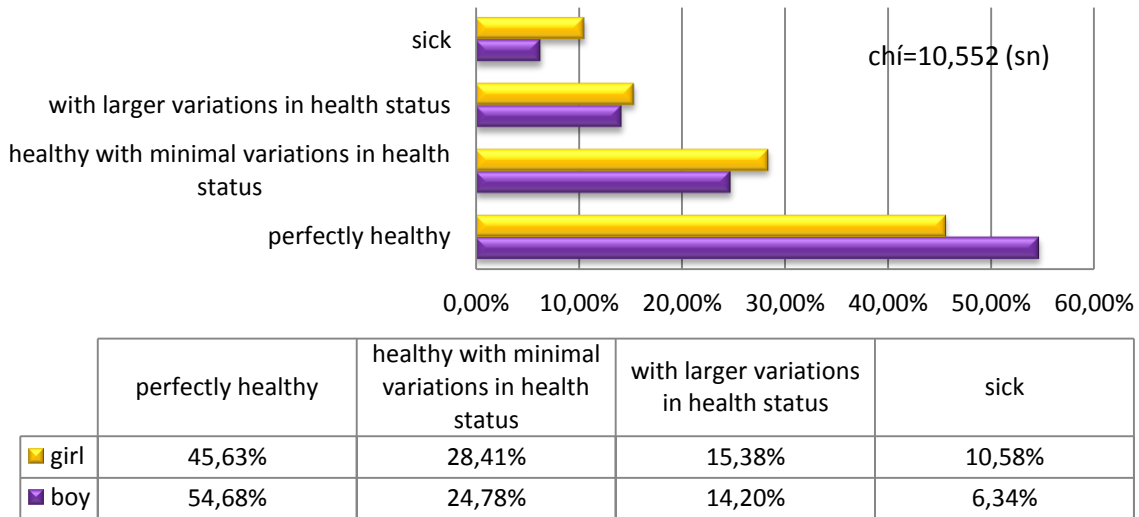


Figure 3a Health status by gender

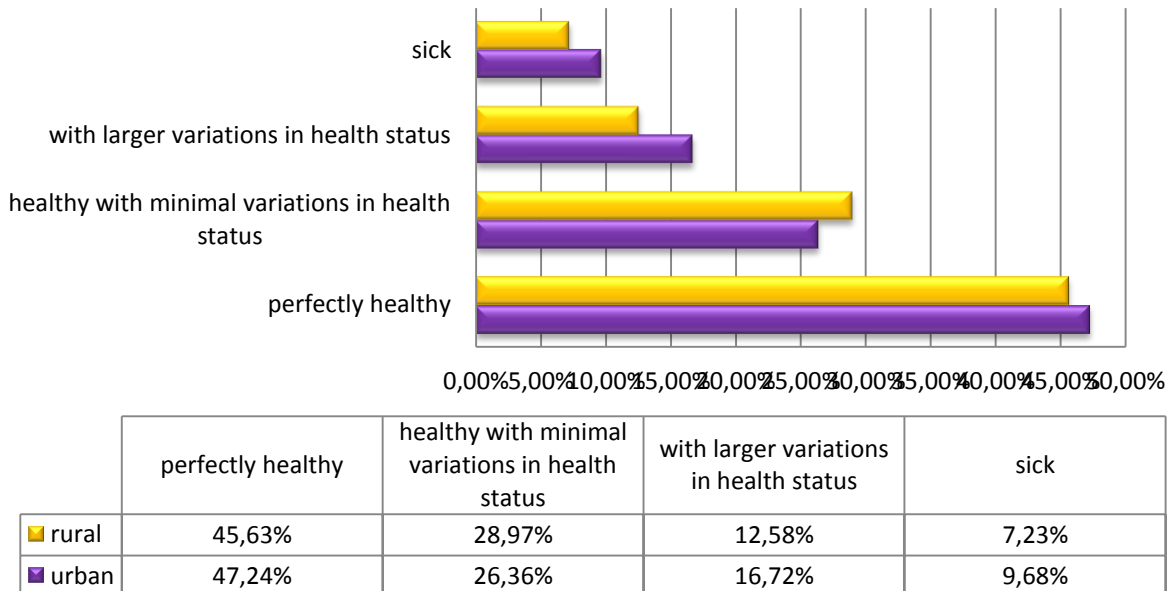


Figure 3b Health status according to residence

The next question we tried to figure out how many hours of free time per day remains pupils after fulfillment of duties during the working week. 38.39 % of girls and 41.84 % of boys said they have three hours per day left of free time, so called. "Time for yourself". As a second option they reported two hours, so we can say that that's really short time, for regeneration as well as for favorite activities We believe that recently, they visit different school activities or art school and so on. (Fig. 4a). We also investigated through comparison of leisure time of students coming from countryside or city. Fig. 4b we can already see quite significant differences in the number of hours of leisure time for students. Up to 38.83 % of pupils from rural areas said they remain two hours per day of leisure and 31.16 % of pupils from rural areas remain three hours. Compared with pupils from the town it is quite not enough time. Urban children, up to 43.06 % have available three hours or even less than 19% is available up to four hours of free time per day. We believe that two hours are for children at this age not enough. But on the other hand, it is good if the other time devoted to leisure time activities as if they use it improperly. I would argue that children from rural areas remain not enough time and because of the traveling and shipping options home from school. In calculating the chi - square we found statistically significant differences in the responses of students from the city and the countryside at  $p < 0.05$ .

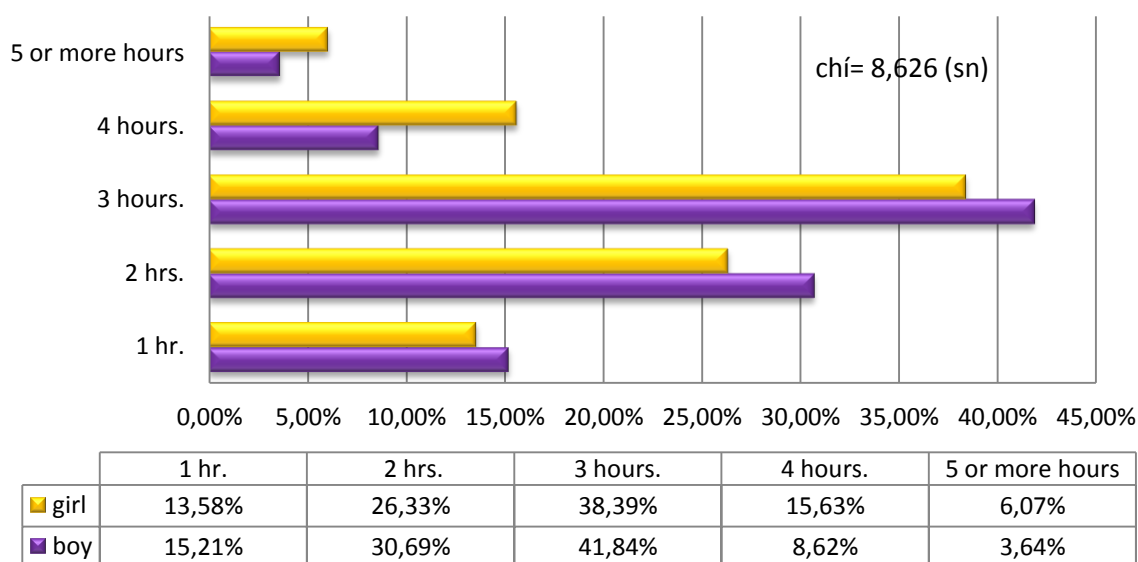


Figure 4a Division of respondents by sex and free time in a week



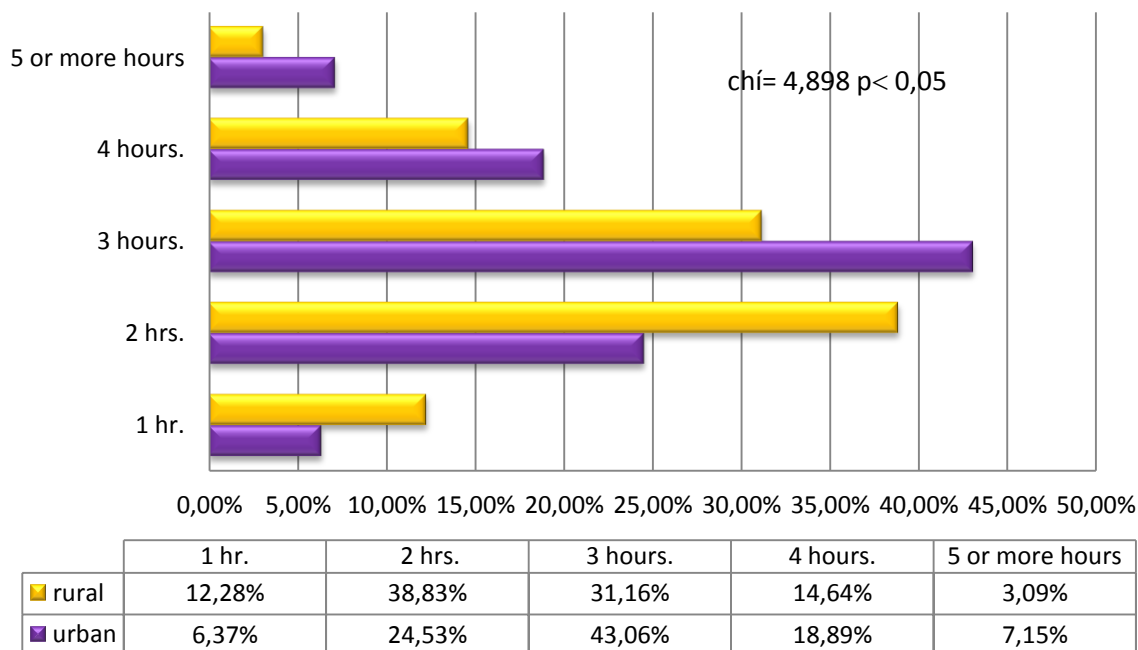


Figure 4b Division of respondents by residence and free time in a week

The next question we wanted to know how many hours of free time students have over the weekend. Here you have the answers but in girls and boys are significantly different. Boys reported that over the weekend they have seven or more hours of free time, but girls have six hours of free time. Based on the review findings, we believe that girls, even if it is weekend, they help parents more with various household chores, but they also focus during the weekend to get ready for school (Fig. 5a). After calculating chi - square we found statistically significant differences in terms of boys and girls at a significance level of  $p < 0.05$ . But we also wonder about comparing students from the city and the countryside. Similar during the working week, students from rural areas have less hours of free time as students from the city. We can say that pupils from rural areas have over the weekend more work around the house and garden and generally they are learnt to help parents more than students from the city (Fig. 5b).

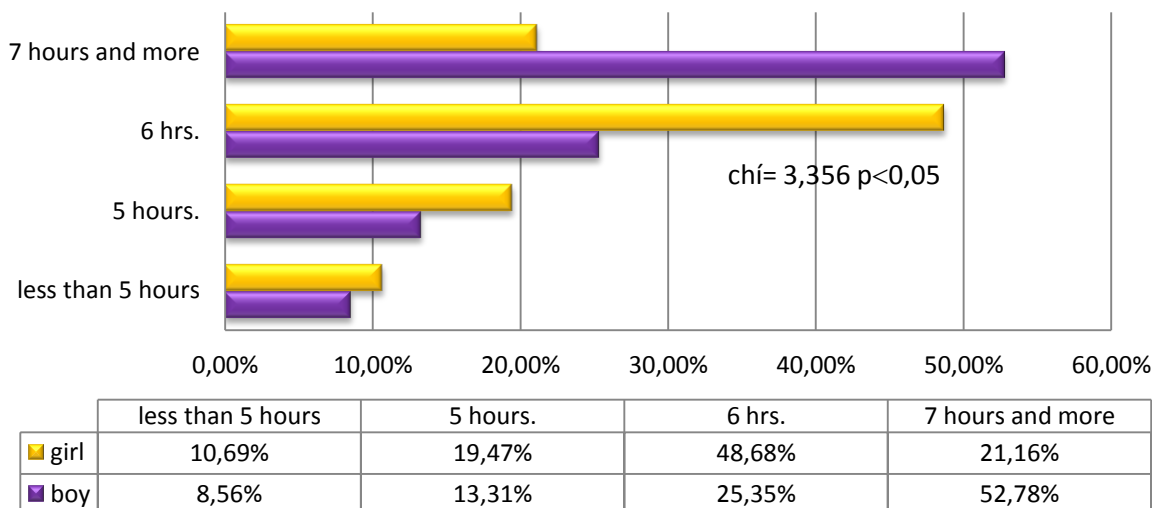


Figure 5a Division of respondents by sex and free time in a week

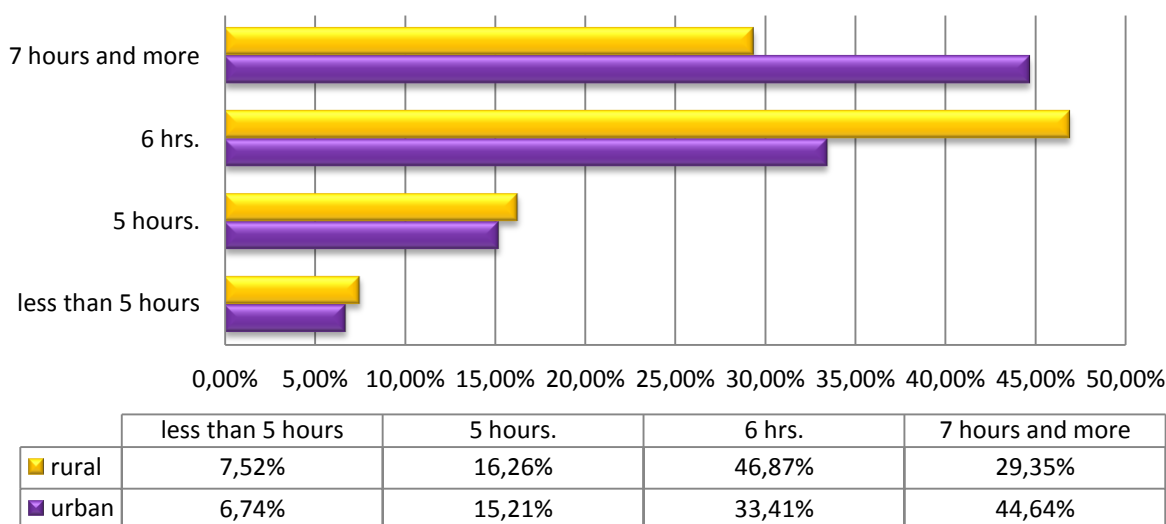


Figure 5b Division of respondents by residence and free time in a week

In the hypothesis H1, we assumed that less than 50 % of secondary school students performed physical activity during leisure time during the working week. As we can see in FIG. 6, physical activity during leisure time within a week devoted to 32.34 % of the students what is basis of the hypothesis H1 we confirmed. At the present time in ultimately evaluated as quite positive finding. It further states that only 38.24 % of students prefer leisure connecting with social networking. These results correspond well with the number of hours of free time during the week. This means that even if they have available three hours of free

time, so the majority of them sit unhealthy using a computer. However, a significant percentage has reached the possibility to carry out physical activity – sport.

We see that during the week in addition to school they hardly meet with friends. We can say that not even listening to music does not belong to their lives, as it was sometime in the past.

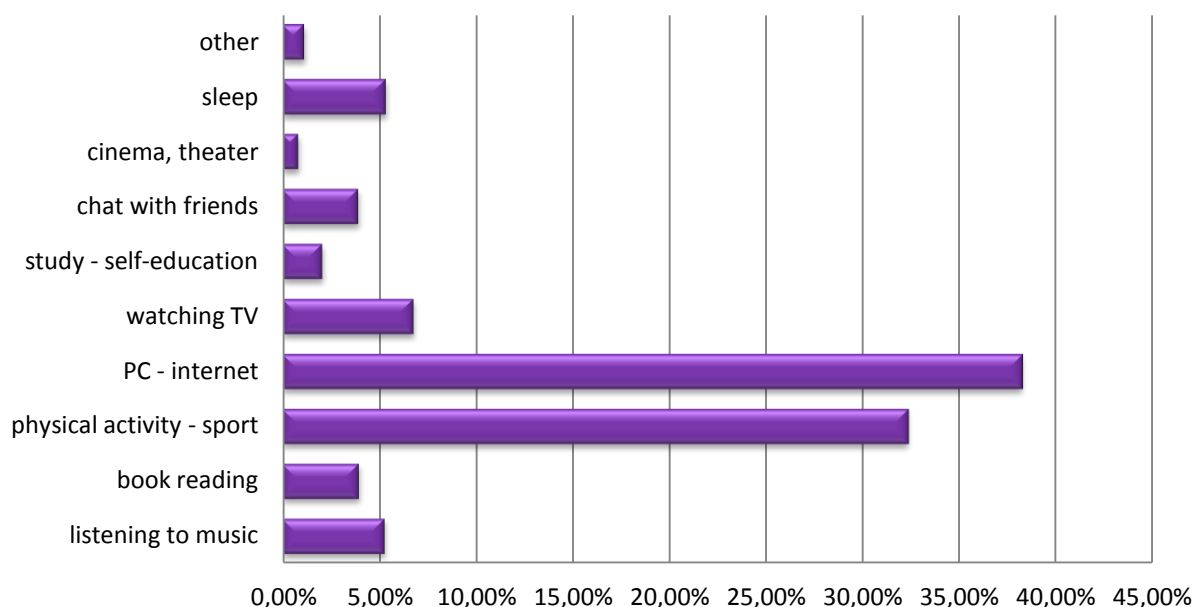


Figure 6 Leisure time respondents during the working week

Next, we looked at how they spend leisure time, which they have over the weekend. The results are very similar to those during the working week, this means that over the weekend they spend their free time mainly using computer and up to 42.63 % of the students, but what is also very positive is that 34.74 % of students are dedicated to sports. Over the weekend, as generally they have more free time available, they can make time 5.48 % of pupils to chat with friends. Based on these results we can conclude that student who participated in our research, prefer social networks before doing sports and in the work week and the weekend. Similar results indicate Michal – Nevolná (2012), Michal (2010), Bartík (2009), Bendíková (2011), Broďáni – Kamas (2011) and others.

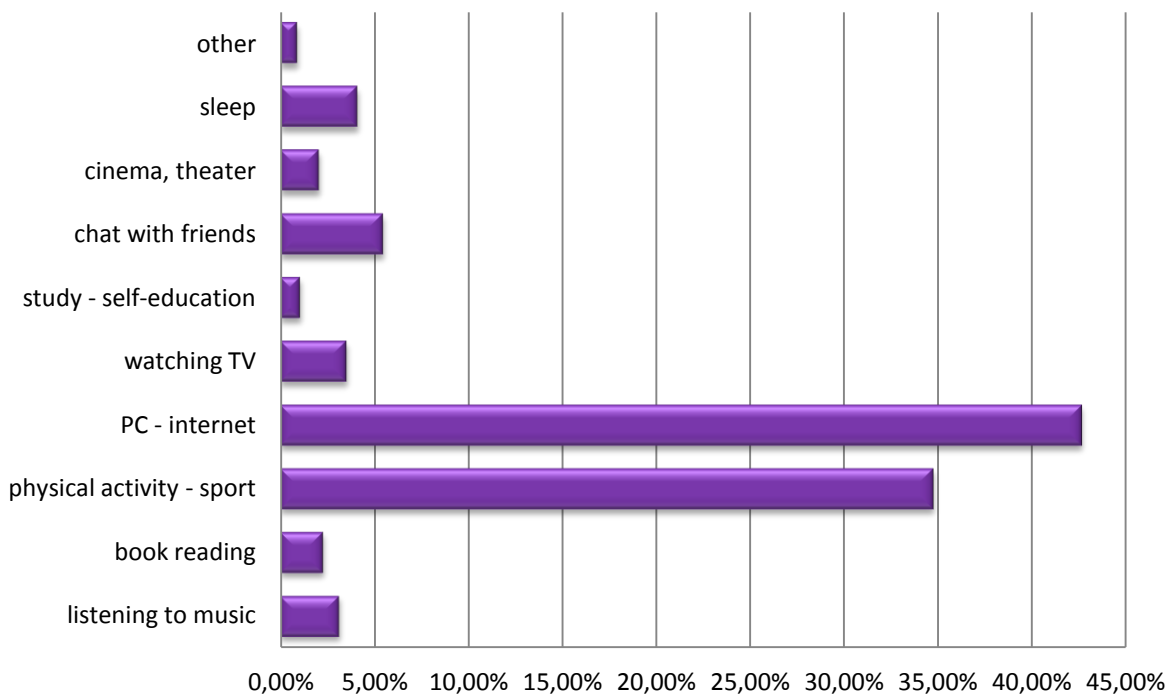


Figure 7 Spending leisure time during the weekend

## CONCLUSIONS

In our work we investigated through a questionnaire opinions and attitudes of secondary school students in Humenne to sport activities in nature. Based on the analyzed results of the research we can conclude the following facts:

Which we assumed that less than 50% of surveyed students during free time within a working week performing physical activities, we confirmed. 32.24 % of students indicated that their leisure time within a working week performing physical activity. Reason why only few students spend their free time carrying out physical activities is the fact that they have low total number of hours of free time which they have left after completion of all necessary duties.

It was captivating by the fact that at the time of good weather 62.16 % boys and 54.69 % girls spend their free time more actively, that is the implementation of a sport - physical activity. There are still a lot of young people who spend their leisure time passively. We consider it as important finding and that youth have led to physical activity mainly parents, which we rate positively. It is a very positive finding that, despite these hurried times parents can find time for their children and use it meaningfully. Unpleasantly surprised was that students do not wish to receive information on physical and sports activities. They don't realize serious fact that realization of physical activity for the human body is very important.

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## **POHYBOVÉ AKTIVITY VO SVOJOM VOĽNOM ČASE STREDOŠKOLÁKOV**

### **SÚHRN**

Cieľom nášho výskumu bolo zistiť a analyzovať názory sa stredoškôľákov v Humennom na pohybové aktivít v ich spôsobe života. Výskum bol vykonaný na troch stredných školách v Humennom. Výskumná skupina sa skladala zo študentov druhého, tretieho a štvrtého ročníka vo veku 16-19 rokov. Dotazník pre žiakov stredných škôl bol rozdelený do kategórií zameraných na voľný čas a pohybovú aktivitu. 32,24% študentov uviedlo, že vo voľnom čase počas pracovného týždňa vykonáva pohybovú aktivitu.

**KLÚČOVÉ SLOVÁ:** pohybové aktivity, voľný čas, stredoškôľáci.

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*The ACTA UNIVERSITATIS MATTHIAE BELII PHYSICAL EDUCATION AND SPORT* is a peer-reviewed scientific journal. The content of the magazine is focused on presentation of research notifications and theoretical studies connected with the problems of science of sport. The Editorial Board is looking forward to all manuscripts written on the above subject.

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Deadline for submissions for each issue of the journal is

**30 May**, respectively **30th November**.

The text of the contribution is in English. The contribution is not to exceed a maximum limit of 15 pages (including tables, pictures, summaries and appendices). A summary will be in the Slovak language, and by rule 1 page at the most. The text is to be presented in MS Word editor.

All contributions are reviewed anonymously.

### **Interface of the contribution**

Title of the contribution, name(s) of its author(s), workplace, summary of the text in English, key words.

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Names of individual chapters are to be written in capital letter from the left margin. References to quoted authors see a brief from the publication.

### **Epilogue of the contribution**

A reference summary, summary including the key words.

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To be written on separate pages. A table is to be marked as TABLE 1 with its name below, write on the left margin above

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We look forward to our further cooperation.

**doc.PaedDr. Jiří Michal, Ph.D,**

science editor

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