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The Problems of Contemporary Education

Selected Factors Influencing the Qualitative Level of Postural Health of Students in Slovakia

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Abstract

The current modern lifestyle of the 21st century has acquired a hypokinetic and sedentary character among the school population, which was further strongly supported by the global Covid-19 pandemic. This further supported the space for the upward trend of diseases, which also include disorders in the musculoskeletal system, postural health. The aim of our study was to find out and point out the factors, which determine the quality of postural health in adolescent students, and their mutual relationships. The sample consisted of 518 students in Slovakia, 266 girls aged$_{(x)}$ 16.5 ± 2.1 years (body height$_{(x)}$ 169.6 ± 6.8 cm, body weight$_{(x)}$ 60.2 ± 7.2 kg) and 252 boys aged$_{(x)}$ 16.9 ± 1.9 years (body height$_{(x)}$ 177.3 ± 8.5 cm, body weight$_{(x)}$ 66.4 ± 7.1 kg). In terms of data acquisition methods in the observed, standardized methods of physical education and pedagogical practice were used. The findings show that in the overall physical regime of students there are significant differences between the genders to the detriment of girls ($p < 0.05$) in terms of volume of physical activities, frequency and intensity ($p < 0.05$). The sedentary lifestyle in both genders showed a lack of physical activity in association with poor posture ($r = 0.789$) (sagittal and frontal plane). Also, higher food intake than energy expenditure results in higher body weight in the sample, which was reflected in the lower limbs (LL to X, $r = 0.717$ and foot pain $r = 0.739$ and fallen arch $r = 0.726$). In the observed sample, incorrect wearing of school bags was also found, significantly ($p < 0.05$) to the detriment of girls, as well as wearing incorrect shoes for both genders. These findings suggest that there are risk factors in students' lifestyles that contribute to the quality of their postural health, which need to be given much more attention in terms of primary prevention in both school and out-of-school environments. This project was supported by VEGA 1/0427/22 “Prevention of students' postural health by physical activity".

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1. Introduction

Health behaviours and attitudes encompass various factors that affect individual components of our health throughout our life. Regular physical activity plays a vital role in this process. "Every year, physical inactivity (passivity) costs Europe more than 500,000 deaths and over 80 billion euros" (EPRS, 2020). "According to conservative estimates, its economic impact will amount to 125 billion euros in 2030". The importance of physical activity for prevention of health problems is growing and schools play an irreplaceable role in it (EPRS, 2020), especially physical education, which is part of school curricula in the EU countries and a compulsory subject in primary and secondary schools. The average time allocation in the EU is 70 physical education lessons per year, which is only one third of time dedicated to languages and fifty percent of time allocated to mathematics (A Tesi..., 2020; Csillag, Kubišová, 2020). In Slovakia, primary and secondary school students have a total of 13,000 classes. However, they spend only about 7 % of this time doing physical activities. The remaining amount of time is allotted to theoretical knowledge (Bendíková, 2018).

Contemporary lifestyle in schoolchildren and students abroad, as well as in Slovakia, has become hypokinetic (Marques et al, 2015; Arundel et al., 2016; Panahi, Tremblay, 2018; WHO, 2020). Slovak students at primary and secondary schools are becoming less interested in mandatory and optional physical activities, no matter if they are organised or not. Research shows that 70 % of schoolchildren in Slovakia spend more than four hours playing computer games, searching the Internet, watching TV and playing on their mobile phones. Only every third student performs organised physical activities. As far as physical and sports education in Slovakia is concerned, there is one growing phenomenon – children that do not do physical activity at school. The number of students exempted from physical education or any physical activity due to various diseases and disorders is increasing as well. There are between 4 to 6 % of pupils with health problems at elementary schools and 13 % of students at secondary schools. These high rates really deserve more attention on the part of parents, students, schools and state institutions (Bendíková, 2018).

In 2007, the European Parliament adopted the Resolution on the Role of Sport in Education emphasising the bad situation related to physical education in schools of the EU member states and proposing a minimum of 3 PE lessons per week (EPRS, 2020; ICSSPE, 2010). The countries responded as follows: Hungary 5 lessons per week, Poland 4 lessons a week, Ukraine and Slovenia 3 lessons per week, France 5 lessons per week, Germany 4 lessons a week, Austria 150 minutes, Finland 135 minutes, Bulgaria 120 minutes, Belgium 100 minutes, Greece 240 minutes, Luxembourg 150 minutes and Spain 180 minutes. Not only did these countries increase the number of PE lessons per week, but they also diversified their curricula with the aim of improving their PE teaching processes. Physical education abroad focuses on improving students' health and (health-oriented) fitness and developing positive attitudes towards lifetime physical activity, which serves as primary prevention of "chronic non-infectious diseases". In Slovakia, these goals have not been fully achieved yet.

Sedentary and hypokinetic lifestyle among students abroad and also in Slovakia has led to a growing number of chronic non-communicable diseases, which used to be prevalent among middle-aged and old generation, but are now becoming more common among school population. Comparison of morbidity rates between the years 1996 and 2008 shows that the number of diseases and disorders per 10.000 children aged between 0 and 14 years has more than doubled. The increase in these rates has been even higher among adolescents aged from 15 to 19 years, when it comes to cardiovascular, metabolic and musculoskeletal diseases and disorders. There is an increase in the prevalence of respiratory diseases as well. Asthma and allergy diagnosis rates has more than tripled since 2000. In addition, mental disorders such as anxiety and depression are becoming more common. The prevalence of the flu and flu-like illnesses among children has grown by 34 % (Bendíková, 2018).

Lack of physical activity and unhealthy diet lead to an increasing number of obese people worldwide (WHO, 2017). Slovakia is also facing the obesity epidemic in school population (Bendíková et al., 2020). Research results show that approximately 18 % of children are overweight and about 7 % are obese, and the situation is getting worse. What is more, there is an increase in the prevalence of type 2 diabetes, which reduces life expectancy by 9 to 15 years. It is estimated that physical inactivity causes 10 to 16 % of diabetes mellitus cases. The number of diabetics has grown by 27 % since 2007. According to diabetologists, every third child born in the new millennium will

be diagnosed with diabetes mellitus, while now it is every 17th child. Watching TV for two hours every day also increases the risk of developing obesity and diabetes.

Nowadays, we encounter many factors that trigger functional and structural disorders in the musculoskeletal system. They are usually associated with the development of civilization and modern lifestyle. Proper posture is of great importance for the proper growth and development of children. Posture is influenced by uncontrollable endogenous factors and uncontrollable exogenous factors (which include physical activity, environment, habits, family environment, playing video games on TV, computer ...) (Straker et al., 2016; Straker et al., 2018).

The Slovak educational system is lagging far behind other countries when it comes to organisation of physical activity for school-aged children, which leads to deterioration in their health, fitness and general physical performance. This trend has been confirmed by several research findings. In the 2019–2020 school year, the Slovak Olympic Committee conducted pilot testing of pupils aged between 11 and 12 years in 39 Slovak schools. The total number of participants was 1.707 (878 boys and 829 girls). The research was based on the comparison of the Olympic Fitness Badge measurement results and the results of the Eurofit testing, which was conducted in 1993. The comparison included only those disciplines, which were monitored in both testing (standing long jump, timed sit-ups (30 seconds), endurance shuttle run, medicine ball overhead backward throw, static pull-up hold and shuttle run 10 x 5 m). The comparison showed the decrease in athletic performance in all five disciplines, both among boys and girls. The most significant decline was found in endurance shuttle run (30 %) and static pull-up hold (51 %) (SOSC, 2021). The decline in physical fitness was also caused by the Covid-19 pandemic, which resulted in weight gain among school population (Boyland, Halford, 2013; Scurt et al., 2022).

It is estimated that physical performance, fitness and health of today's school children after they turn 35 will be comparable to health status of today's 50-year old people. Diabetologists claim that over the past 40 years energy intake in children has increased by 23 %, while the amount of physical activity they perform has declined four-fold. They also draw attention to the fact that while our brain gets larger as we grow up, our skeletal muscle mass declines as we age.

Physical activity has a profound impact on the quality of life, lifestyle and health. Nevertheless, a sedentary lifestyle has become a serious issue that concerns schoolchildren as well (Sigmund et al., 2009; Panahi,Tremblay, 2018; Reisberg, 2020). That is why we can see increasing global efforts to increase the amount of healthy physical activity among population with the aim of preventing "chronic non-communicable diseases". All EU countries are encouraged to come up with their own recommendations on how much physical activity their citizens should do, taking WHO guidelines into consideration. The number of EU member states that produced such recommendations has risen significantly, beginning with 16 countries in 2011 rising up to 23 in 2018. In addition, there are more and more EU countries (including Slovakia) that have set out their own guidelines concerning physical activity in children and senior citizens.

Regular physical activity is one of the main determinants of health in school population, as well as the prevention of injuries (Nemček, Ladecká, 2020; Lenková, 2021). International comparative studies show that, besides compulsory physical education, schools need to implement other forms of exercise, such as physical activities before and after classes, during the breaks and also while teaching other subjects. Active breaks between classes should be implemented within school curricula (Hardman, 2008; Müller et al., 2008; Bendíková, 2018).

WHO (2018) as well as majority of experts recommend regular physical activity, healthy diet and changes in a daily routine as the best forms of disease prevention. These recommendations have already been implemented in international documents related to political decisions that have been taken with regard to health promotion. According to these documents, children and adolescents at schools should perform 60 and more minutes of moderate-intensity physical activity that should include age-appropriate, pleasant and diverse exercises.

Based on all the above-mentioned findings, the aim of our study was to find out and point out the factors, which determine the quality of postural health in adolescent students, and their mutual relationships.

2. Methodology

Research participants. The sample group n = 518 was composed of adolescent students from Slovakia. It comprised of 266 girls, whose average age$_{(x)}$ was 16.5±2.1 years, average body height$_{(x)}$ 169.6±6.8 cm and average body weight$_{(x)}$ 60.2±7.2 kg. The group also consisted of 252 boys, whose

average age$_{(x)}$ was 16.9 ±1.9 years, average body height$_{(x)}$ 177.3±8.5 cm and body weight$_{(x)}$ 66.4±7.1 kg). Table 1 shows the primary characteristics of the sample group.

Table 1. Primary characteristics of the sample group (n = 518)

(n = 518)	Girls (n = 266)		Boys (n = 252)	
	Body height/cm	Body weight/kg	Body height/cm	Body weight/kg
Factors	169.6 ± 6.8	60.2 ± 7.2	177.3 ± 8.5	66.4 ± 7.1
Age/years	16.5 ± 2.1		16.9 ± 1.9	
BMI	23.2 ± 1.5		23.3 ± 1.4	

Notes: BMI – Body mass index

Data collection and organization. The research was conducted in several consecutive stages in the year 2022 (3^{th}-5^{th} month). As far as data acquisition is concerned, we applied standardised procedures. We used CINDI standardised questionnaire to obtain information about students' daily routine. The questions were selected in accordance with the above-mentioned partial task. Basic somatometric measurements focused on body weight were performed by a highly precise and non-invasive method – by means of Tanita RD-953 body monitor that uses dual frequency bio-electric impedance analysis – BIA. We used a standardised method to carry out assessments of the musculoskeletal system, overall body posture, foot posture and pain, the results of which are used by physical education and medical experts. Subsequently, we evaluated the static component of overall standing, the body posture, using the method developed by Klein and Thomas and modified by Mayer (Bendíková, 2017). This method evaluates body posture by totalling up points each monitored area gets. The points given range from 1 to 4 according to the current level of body posture. This assessment was followed by classification into the qualitative body posture levels. The evaluation was focused on: I. Head and neck posture, II. Chest (shape), III. Abdomen and pelvic inclination, IV. Spine curvature, V. Frontal body posture (Evaluation of shoulders – Shoulder blades/scapulas). Evaluation of body postures: I. Correct body posture – 5 points, II. Good body posture – 6–10 points, III. Bad body posture – 11–15 points, IV. Incorrect body posture – 16–20 points. After that, we assessed foot posture using the non-invasive diagnostic podoscope. We evaluated foot posture from the rear as we focused on the ankle joint: a) (1 point) – slim ankles touching each other, good upright posture, b) (2 points) – ankles are slightly turned inwards, c) (3 points) – ankles roll excessively inwards, overpronated feet collapse inwards, bad posture. Pain intensity was measured by means of the visual analogue scale (VAS) – an 11-point Likert scale: 0 = no pain, 10 = pain as bad as it could possibly be (Vojtaššák, 2000).

It is a cross-sectional study in the framework of longitudinal research, through which we point out that insufficient primary prevention of postural health in adolescence causes health problems of the musculoskeletal system.

Data analysis. We processed acquired data using the IBM SPSS Statistics 17 programme and MS Excel 2017. Data processing was focused on the size (n), percent frequency distribution (%), standard deviation (s), extent of variation ($V_{Rmax-min}$) and arithmetic mean (x). We used an unpaired T-test (T_{test}) and a chi-squared test (χ^2) in order to compare qualitative and quantitative data about the boys and the girls. We also used the effect size (r) analysis, logical analysis and synthesis, induction and deduction as well as comparison and generalisation. The acquired data were then compared with other sources of literature and presented in tables and images.

3. Results

The findings show that there are significant differences between males and females as far as their physical activity routine is concerned. We found that the girls had worse results ($p < 0.05$) in terms of the amount of physical activity they perform (volume - V_{PA}), its frequency ($p < 0.05$) as well as its intensity ($p < 0.05$) (Table 2).

The female students (n = 266) performed 1 hour and 45 minutes of sports physical activity (V_{PA}) per week, hereinafter referred to as PA, including 1 hour and 10 minutes of free-time activities and 35 minutes of exercise done during physical and sports education classes. The male students (n = 252) had somewhat better results as they spent 1 hour and 55 minutes doing spare-time sports activities and 1 hour of physical activity during PE classes. The overall weekly amount

of physical activity (V_{PA}) was not significantly different for male students (Ttest = 0.279, $p > 0.05$) and for female students."

When it comes to frequency (F_{PA}), more than a half of female students (57 %, n = 152) performed physical activity irregularly compared to male students (34 %, n = 86), with a difference ($\chi^2 = 27.311$, $p < 0.05$, df = 3). Only 23 % of the girls (n = 61) and 33 % (n = 83) of the boys perform physical activity only once a week. 15 % of the girls (n = 40) and 26 % of the boys (n = 66) perform physical activity twice per week, while only 5 % of female students (n = 13) and 7 % of male students (n = 7) do sports activities three times a week.

Intensity of physical activity (I_{PA}) is very important when it comes to health. We found out (Table 2) that 67 % (n = 178) of the girls and 42 % of the boys (n = 106) perform low-intensity sports activities, while only 19 % of female students (n = 50) and as many as 45 % (n = 113) of male students do medium-intensity physical activity ($\chi^2 = 28.133$, $p < 0.05$, df = 3). The remaining 13 % of the boys and 14 % of the girls do submaximal or high-intensity exercise.

Table 2. Physical activity among students (n = 518)

Volume of PA/per week	Physical activity and sports			
gender (n = 518)	Leisure time (hour/min)		Physical & sports education	
Girls (n = 266)	1: 10		0 : 35	**Σ** 1: 45
Boys (n = 252)	1 : 55		1 : 00	**Σ** 2 : 55
Difference (d%)	0 : 45		0 : 25	**Σ** 1 : 10
Independent samples T_{test}	$T_{test} = 0.279$ ($p < 0.05$)			
Frequency of PA/per week	Irregularly	1x/week	2x/week	3x/and more
Factors n/(%)	n/(%)	n/(%)	n/(%)	n/(%)
Girls (n = 266)	152 (57 %)*	61 (23%)	40 (15 %)	13 (5 %)
Boys (n = 252)	86 (34 %)	83 (33 %)	66 (26 %)	17 (7 %)
Difference (d%)	66 (23 %)	22 (10 %)	26 (11 %)	4 (2 %)
Chi-square test (χ^2)	$\chi^2 = 27.311$ ($p < 0.05$, df = 3)			
Intensity of PA/per week	Low	Medium	Submaximal	High
Girls (n = 266)	178 (67 %)	50 (19 %)	27 (10 %)	11 (4 %)
Boys (n = 252)	106 (42 %)	113 (45 %)*	20 (8 %)	13 (5 %)
Difference (d%)	72 (25 %)	63 (26 %)	7 (2 %)	2 (1 %)
Chi-square test (χ^2)	$\chi^2 = 28.133$ ($p < 0.05$, df = 3)			

Notes: (n) – size, (%) - percentage, (*) - significance ($p < 0.05$)

Our findings point to a dominant upward trend in sedentary activities (Table 3) compared to active physical activities in the daily routine of schoolchildren. The analysis of the sedentary activity in the monitored group of schoolchildren (n = 518) shows that on average 1/3 of the day has a sedentary character, to which it is necessary to mention another on average 4.5 hours/day online classes and on average 1.2 hours preparation for classes. On average, schoolchildren spent most time (3 hours/day) watching television (82 %, n = 427), 76 % (n = 394) of schoolchildren reported time spent at PCs with the internet, mobile phones, or listening to music, and 56 % (n = 290) reported playing on computers and mobile phones.

Table 3. Average time schoolchildren spend doing sedentary activity (n = 518)

Average time spent in sedentary activity	(x)	(n)/%
Time spent watching TV	3 hours	427 (82 %)
Time spent gaming on computer and mobile	2.1 hours	290 (56 %)
Time spent learning	1.2 hours	202 (39 %)
Time spent on PC, internet, (outside of class) ...	2.2 hours	394 (76 %)
Total hours/x(%)	8.5 hours	326/(63 %)

Notes: (x) - arithmetic mean, (n) – size, (%) - percentage

Table 4 presents the most common postural disorders in our sample group (n = 518). Kyphotic body posture was found in 30 % of the boys (n = 76) and 18 % (n = 48) of the girls. 12 % (n = 32) of female students and 9 % (n = 23) of male students had hyperlordotic posture. Scoliotic body posture prevailed in 41 % of the girls in contrast with 20 % of the boys (n = 50), with a difference ($\chi^2 = 18.987$, $p < 0.05$). There were 6 % (n = 16) of the girls and 4 % (n = 10) of the boys who had hypolordotic body posture.

Table 4. Functional postural disorders in students (n = 518)

Body posture/ factors	Kyphotic body posture	Hyperlordotic body posture	Hypolordotic body posture	Scoliotic body posture
gender (n = 518)	n/(%)	n/(%)	n/(%)	n/(%)
Girls (n = 266)	48 (18 %)	32 (12 %)	16 (6 %)	109 (41 %)*
Boys (n = 252)	76 (30 %)	23 (9 %)	10 (4 %)	50 (20 %)
Difference (d%)	28 (12 %)	9 (3 %)	6 (2 %)	59 (20 %)
Chi-square test (χ^2)	$\chi^2 = 18.987$ ($p < 0.05$, df = 3)			

Note: (n) – size, (%) - percentage, (*) – significance ($p < 0.05$)

Body posture indicates whether the muscular system functions properly or not. Table 5 presents our findings in this area. We found out that only 8 % (n = 21) of female students had correct body posture, 15 % of them (n = 40) had good body posture, 66 % (n = 176) had bad body posture and 11 % (n = 29) of the girls had incorrect body posture.

Table 5. Overall posture evaluation in schoolchildren (n = 518)

Body posture/ points (p)	Correct body posture (0-5 p)	Good body posture (6-10 p)	Bad body posture (11-15 p)	Incorrect body posture (16-20 p)
gender (n = 518)	n/(%)	n/(%)	n/(%)	n/(%)
Girls (n = 266)	21 (8 %)	40 (15 %)	176 (66 %)*	29 (11 %)
Boys (n = 252)	30 (12 %)	66 (26 %)	123 (49 %)	33 (13 %)
Difference (d%)	9 (4 %)	26 (11 %)	53 (17 %)	4 (2 %)
Chi-square test (χ^2)	$\chi^2 = 17.790$ ($p < 0.05$, df = 3)			

Note: (n) – size, (%) - percentage, (*) – significance ($p < 0.05$)

As far as male students are concerned, 49 % (n = 123) had bad posture, 26 % (n = 66) of them had good posture, 12 % (n = 30) had correct body posture and 13 % (n = 33) of the boys had incorrect body posture.

The aforementioned findings show that female students had worse body posture in comparison with male students. Following the quality assessment of body posture, we found a difference between female and male students ($\chi^2 = 17.790$, $p < 0.05$, df = 3) at the third level of quality (bad body posture), with the girls having worse posture than the boys. The average assessment was (x) 12 ± 2.79 and the extent of variation ($V_{Rmax-min}$) equalled to 10.

Sedentary lifestyle and a lack of physical activity in both genders are associated with overall improper body posture ($r = 0.789$) in sagittal and frontal planes. There was a difference ($\chi^2 = 27.109$, $p < 0.01$) between the girls and the boys when it comes to pain in the lumbar and cervical spine: 63 % of the girls (n = 168) and 29 % of the boys (n = 73).

In terms of evaluation of body posture of the individual segments, we found the following: female respondents faced problems with abdomen and pelvic inclination in the highest percentage, which consisted of more than half of them, followed by spine curvature and frontal body posture. Among male respondents, the highest percentage was found in the head and neck posture followed by abdomen and pelvic inclination and frontal body. For both genders the lowest percentage was with chest issues.

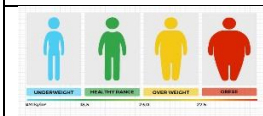
Table 6. Evaluation of individual body posture regions in schoolchildren (n = 518)

Points/ evaluation	I. G B	II. G B	III. G B	IV. G B	V. G B	VI. G B
1	18 % 15 %	48 % 50 %	11 % 20 %	14 % 19 %	16 % 17 %	22 % 30 %
2	22 % 18 %	39 % 31 %	17 % 24 %	28 % 27 %	38 % 25 %	23 % 38 %
3	46 % 53 %	10 % 14 %	56 % 49 %	52 % 43 %	47 % 46 %	49 % 22 %
4	14 % 14 %	3 % 5 %	16 % 7 %	6 % 11 %	6 % 12 %	6 % 10 %
Chi-square test (χ^2)	$\chi^2 = 16.667$ ($p < 0.05$, df = 5)					

Notes: I. posture of head and neck evaluation, II. shape of thorax evaluation, III. shape of the abdomen and the inclination of the pelvis evaluation, IV. total curvature of the spine evaluation, V. height of the shoulders and the position of the shoulder blades evaluation, VI. lower limbs evaluation, 1-4 points, G – Girls, B – Boys

The Table 7 shows the evaluation of BMI and fat percentage in students (n = 518) among girls and boys. There are 4 levels of BMI and fat percentage. 42 % (n = 112) of the girls and 56 % (n = 141) of the boys were in the second level, that is considered as normal or optimal one.

Table 7. The evaluation of BMI and fat percentage in schoolchildren (n = 518)

Factors/genders	**Assessment of BMI and fat in students (n=518)**							
Levels of BMI	**I. underweight**		**II. normal**		**III. overweight**		**IV. obese**	
Gender/girls/boys	**G (n=266)**	**B (n=252)**	**G (n=266)**	**B (n=252)**	**G (n=266)**	**B (n=252)**	**G (n=266)**	**B (n=252)**
BMI (n %)	9 %	6 %	**42 %**	**56 %**	39 %	31 %	10 %	7 %
								
Gender/girls/boys	**I. low**		**II. normal**		**III. increased**		**IV. high**	
% Fat	9 %	6 %	**39 %**	**51 %**	37 %	34 %	15 %	9 %
Good/Bad for health	✗	✗	✓	✓	✗	✗	✗	✗

Also 39 % (n = 104) of the girls and 51 % (n = 129) of the boys, according to the amount of fat percentage, were in this normal level. Each value that is shifted to the right or left is not the best one. It has a negative impact on health and postural health of students.

As far as our sample group (n = 518) is concerned, we found that the body weight in both genders had an impact on lower limbs. This means that overweight and obese students had valgus X-shaped feet, r = 0.717, foot pain r = 0.739 and a fallen foot arch = 0.726.

The examination of feet in our sample group (n = 518), which was carried out by means of a podoscope, showed that 45 % (n = 233) of the subjects fall under the first and second category (1 and 2 points), while 49 % (n = 254) belong to the 3rd category and the remaining 6 % (n = 31) of students were assigned to the 4th category. During the examination of ankle posture, 44 % (n = 228) of students were given 1point. Their ankles were slim and they touched each other; they had good upright posture. Only 9 % (n = 47) of the students were assigned to the 3rd category (3 points). Their ankles rolled excessively inwards, their overpronated feet collapsed inwards, which means that their posture was bad. We also found out that 47 % (n = 243) of the students fell under the 2nd category (2 points) because their ankles were slightly turned inwards. According to these findings, we can draw a conclusion (while respecting other factors) that increased body weight and obesity are associated with foot posture.

As far as proper carriage of school bags is concerned, there was a difference ($\chi^2 = 15.731$, $p < 0.05$) with worse results for the girls (58 %, n = 154). Both female and male students wear improper footwear.

4. Discussion

Lack of physical activity and low intensity of exercise in these difficult times can significantly contribute to prevalence of functional and structural health problems, including disorders of the musculoskeletal system.

Overall body posture of the students in our sample group was influenced by an improper postural stereotype caused by insufficient motor control, low neuromuscular coordination as well as other external and internal factors. It is important to emphasise that the deep stabilisation system (the core consisting of abdominal, spinal and pelvic regions), which connects the upper and lower body parts, plays a vital role in motor control. The balance between the aforementioned regions is a prerequisite for a proper body posture. Incorrect movement stereotypes make individual muscle groups in a muscle gain generalised, which results in improper posture of shoulders, hip stability and extension, limited range of motion and pain at the back of the thigh, ankles and feet.

Kratenová et al. (2007) reported in their study that on average children spent 4 hours per week playing sports and 14 hours per week watching TV/VCR and playing computer games. 20 % of children had a significantly higher probability of poor posture than children who played sports. Incorrect posture was diagnosed in 38.3 % of children, more often in boys. While in our group, we found incorrect posture to be more common in girls. Children with poor posture more often reported headaches and cervical and lumbar spine pain, as in our sample.

Yang et al. 2020 of their studies found incorrect postures in children and adolescents in 65.3 %. Where girls had a higher prevalence of poor posture than boys. With increasing age, the prevalence of incorrect posture was higher, which confirmed the similarity of our findings.

Musculoskeletal disorders often begin to develop in childhood due to improper body posture and insufficient amount of physical activity in children's daily routine (Rodríguez-Oviedo et al., 2018). Other factors that have an impact on body posture include the weight of school bags and their carriage (Bueno, Rech, 2013) as well as wearing appropriate footwear (Ningthoujam, 2014).

In addition, body posture in children is considerably influenced by their body weight. Nowadays, rates of childhood overweight and obesity are increasing worldwide. This is a public health problem that affects people's health in their adulthood. Visceral obesity represents a risk factor for type 2 diabetes mellitus, atherosclerosis and cardiovascular diseases (Neeland et al., 2019). What is more, excessive weight and obesity greatly contribute to improper posture of lower limbs and feet (Maciałczyk-Paprocka et al., 2017), where one region disrupts proper functioning of the knee, the hip joint and the lumbar spine (Kussuki et al., 2007). That is why appropriate and timely intervention is very important (Černický et al., 2018, Bendíková, 2020, Bendíková, Balkó, 2022). Considering all the above, it is necessary to devote attention to health-oriented fitness in children (body composition, body weight, body posture, physical performance, etc.) (Cristi-Montero et al., 2014; Mayooran et al., 2014).

5. Conclusion

Our findings confirm that amount, frequency and intensity of physical activity in schoolchildren are on the decline. Even though boys do less sports and exercise, the amount of physical activity in girls is even smaller. We found out that today's schoolchildren lead a sedentary lifestyle. Pain occurs when they are physically inactive. The girls in the sample group had worse body posture than the boys. A lack of physical activity is associated with bad body posture, while excessive weight can lead to foot pain and the fallen arch.

It is important to bear in mind that a lifestyle and a positive health attitude develop throughout our lives and that they depend on many factors such as upbringing, social and economic environment, traditions, stereotypes, laziness, education, experience, etc. Adoption of a healthy lifestyle also requires consistency, perseverance and determination. That is why now physical education plays such a vital role.

Physical and sports education directly or indirectly creates the space for diversification and innovation of the curricula and classes that should have a positive effect on health determinants as well as physical, functional and motor development and health-focused physical fitness of school-aged children and adolescents.

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7. Conflict of interest

The authors declare no conflict of interest.

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