POSTURE DEFECTS OF STUDENTS IN GRADES 1–4 OF MUSIC ORIENTED CLASSES IN PRIMARY SCHOOL COMPLEX NO. 2 IN SZCZECIN

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Abstract. The aim of the research was to establish whether the children between the ages of 7 and 10 years, attending Grades 1–4 of music oriented and general education classes, suffered from posture defects.
The research material included 214 children aged 7–11 of the Primary School Complex no. 2 in Szczecin. There were 101 children examined in the music oriented classes, including 51 (50.5%) girls and 50 (49.5%) boys.
In the school year 2006/2007, the research was conducted twice, including the same research material – first in September 2006, second in June 2007 accordingly. Body surface topography method, based on the technique of spatial photogrammetry, was used to evaluate body posture. The research included the analysis of thoracic kyphosis and lumbar lordosis angle in the sagittal plane.
The results of independent research showed that proper posture in the sagittal plane was present in 62.0% girls and 71.0% boys from music oriented classes, as well as 73.0% and 75.0% in controls accordingly. Rounded back was characteristic for 31.0% girls and 25.0% boys from music oriented classes, as well as 14.0% and 16.0% in controls. Flat back was visible in 6.0% female musicians and 12.0% controls, with 4.0% boys and 13.0% controls accordingly. Based on the conducted research, the following results were formulated:
1. Physiological spinal curvatures of children in music oriented classes were more serious in comparison with peer controls.
2. Posture defects were more common in girls in music oriented classes, compared to controls.
3. The incidence of posture defects in boys in music oriented classes and controls was parallel.
4. The national curriculum program of study for PE in music oriented classes should be modified and complemented with exercises strengthening trunk muscles and increasing the range of motion in shoulder and pelvic girdles.

Key words: posture defects, maladies in musicians, musicians' health and safety

Introduction

Students of music schools are very talented children who come from families with long, multigenerational traditions and passion for music. Thus, music is an important aspect of their lives, and a musical performance at

a professional level requires an aim-oriented, systematic, daily practice from the beginning of the learning process (Gedl-Pieprzyca 2001). Such children are exposed to all sorts of disorders of the statics of the body and the asymmetries of the shaping of the trunk (Demczuk-Włodarczyk et al. 2002; Kluszczyńska 2003; Kaneko et al. 2005). This is substantially affected by the forced position of the body during practice and concerts (Larsson et al. 1993; Liu and Hayden 2002; Burkholder and Brandfonbrener 2004; Foxman and Burgel 2006).

Bubka and Poznańska (2000) together with Gołąb et al. (2003) showed that posture defects and lateral curve of the spine are more common among students of music schools than in peers from general education schools. Therefore, early diagnosis and prevention are very important factors as the treatment of defects is not always fully effective (Szczygieł et al. 2001).

The aim of the study was to determine whether there were posture defects in the sagittal plane of the trunk in children aged 7–10, attending Grades 1–4 of music oriented and general classes of the Primary School Complex no. 2 in Szczecin.

Research material

The research material constituted of 214 children aged 7–11 from the Primary School Complex no. 2 in Szczecin, including 108 (50.5%) girls and 106 (49.5%) boys attending Grades 1–4 of music oriented and general classes (Table 1).

Table 1. The number of analyzed children from the Primary School Complex no. 2 in Szczecin

Child's age	Girls		Boys		All	
	n	%	n	%	n	%
7	26	51.0	25	49.0	51	100.0
8	24	50.0	24	50.0	48	100.0
9	29	51.8	27	48.2	56	100.0
10	29	49.2	30	50.8	59	100.0
All	108	54.2	106	45.8	214	100.0

In music oriented classes, 113 children were analyzed, including 51 (50.5%) girls and 50 (49.6%) boys. In control classes, 113 children were analyzed, including 57 (50.4%) girls and 56 (49.6%) boys (Table 2).

Table 2. The Number of children in grades 1–4 of general and music oriented classes in the Primary School Complex no. 2 in Szczecin

Class	Class profile											
	Music						General					
	Girls		Boys		All		Girls		Boys		All	
	n	%	n	%	n	%	n	%	n	%	n	%
I	12	50.0	12	50.0	24	100.0	14	51.9	13	48.1	27	100.0
II	12	50.0	12	50.0	24	100.0	12	50.0	12	50.0	24	100.0
III	13	52.0	12	48.0	25	100.0	16	51.6	15	48.4	31	100.0
IV	14	50.0	14	50.0	28	100.0	15	48.4	16	51.6	31	100.0
All	51	50.5	50	19.5	101	100.0	57	50.4	56	49.6	113	100.0

The largest group consisted of children from piano, then violin, guitar, flute, clarinet, cello and percussion classes (Table 3).

Table 3. The number of children in the respective instrument classes of the Primary School Complex no. 2 in Szczecin

Instrument	Girls		Boys		All	
	n	%	n	%	n	%
Piano	20	39.2	22	44.0	42	41.6
Violin	13	25.5	11	22.0	24	23.8
Guitar	7	13.7	8	16.0	15	14.9
Flute	5	9.8	3	6.0	8	7.9
Clarinet	3	5.9	1	2.0	4	4.0
Cello	2	3.9	2	4.0	4	4.0
Drums	1	2.0	3	6.0	4	4.0
All	51	100.0	50	100.0	101	100.0

Due to the necessary comparison of children from parallel classes (music oriented and general education), the research material has been classified into Grades 1, 2, 3, 4 categories. However, individuals attending the 1st grade on the day of the survey, at the age between 6 years, 6 months and a day up to 7 years and 6 months, have been placed in particular grades, for example the 1st grade (Lewandowski 2006). Individuals, who were in the 1st grade on the day of the survey, but did not meet the age range criteria, were eliminated from the set of observations. Similarly, the same pattern was adopted towards children in other classes.

The basis for the selection of students for the research was the written consent of their parents and the headmaster of the school. The Primary School Complex no. 2 introduced, as part of school preventive healthcare, swimming classes for children of music oriented groups in the first 3 years of education, financed by their parents. Swimming classes were part of the integrated teaching during one of the three hours of motor skill classes a week, taking place in the nearby Secondary School no. 1 in Szczecin, equipped with a swimming pool. In addition, students of Grades 1–3 of music oriented classes took part in rhythmic classes, held once a week for the first three years of study.

Children of general education classes which constituted for the control groups, given the limited financial resources of parents and the school, did not take part in the swimming classes. Subjects from the control groups did not attend any motor skill classes, except mandatory PE classes.

Based on the school health cards and interviews with parents, children with documented irregularities in the musculoskeletal system have been excluded from dispensary groups. On the day of the beginning of research, in accordance with the doctor's opinion, children were considered generally healthy.

Methods

In the school year 2006–2007, the research was conducted twice – the first in September 2006 whereas the second in June 2007.

All students were analyzed in identical conditions and in the same order:

– height and weight measurements,
– body posture measurements.

The research studies were carried out under the supervision of the author by the same research team (students of the Institute of Physical Culture, FES, Szczecin University), which had been previously prepared both theoretically and practically.

Members of the School Head Office and children's parents gave pupils written consent to participate in the research. Parents and students were informed about the purpose of the research, method, and the ability to opt-out at any time, without any consequences.

The research program received favorable opinion of the Bioethics Committee of the Pomeranian Medical Academy in Szczecin (resolution no BN-001/133/07).

The analysis of somatic traits included height measurements to the nearest 0.1 cm by means of the Martin anthropometer, as well as body weight to the nearest 0.1 kg using medical scales (Jopkiewicz and Suliga 2011).

For posture evaluation, body surface topography was used, employing computer equipment manufactured by a Wrocław based company CQ Elektronik System (Świerc 2005). The device used a noninvasive photogrammetric technique (Moiré phenomenon) (Tokarczyk and Mazur 2006; Tokarczyk and Szczygieł 2008). The method applied in this study is based on taking pictures of the spine by video camera, followed by their computer analysis – photogram (Denton at all 1992; Nowotny at all 2002; Fernandes at all 2003; Hackenberg at all 2003; Chowańska at all 2009; Mrozkowiak 2010). Evaluation of the results was made by a doctor – head of the Department of Rehabilitation and Sports Traumatology Institute of Physical Culture, FES, Szczecin University (now the Faculty of Physical Culture and Health Promotion, Szczecin University).

Two angular parameters, characterizing posture of the examined children in the sagittal plane, were analyzed (Table 4).

Table 4. A list of the analyzed trunk parameters of children in Grades 1–4 of general and music oriented classes in the Primary School Complex no. 2 in Szczecin

No.	Parameters			
	Symbol	Measurement unit	Name	Explanation
1.	KKP	degrees	The cervical kyphosis angle	KKP = 180 – (BETA + GAMMA)
2.	KLL	degrees	The lumbar lordosis angle	KLL = 180 – (ALFA + BETA)

ALFA – the slope of the lumbosacral spine,
BETA – the slope of the thoracorumbal spine ,
GAMMA – the slope of the supreme thoracic spine.

The standards used to describe body posture on the basis of body surface topography for children population in Szczecin have not yet been published. Therefore, measurements' results were confronted with the normative ranges developed by Mrozkowiak (2010) for the population of children of Warmia and Mazury.

It is assumed that the body posture with the cervical kyphosis angle in the normative ranges according to Mrozkowiak (2010) was considered the correct posture, above the upper limit – flat back posture, below the lower part – rounded back.

Similarly, it was found that the body posture of the lumbar lordosis angle within the limits of the normative ranges was considered correct, above its upper limits of posture – flat back, and below the lower part – concave back.

Statistical analysis was carried out using a statistical program Statistica PL version 7 and MS Excel 7.0. spreadsheet.

The following distribution characteristics of quantitative variables were made (Stanisz 2000):

- For discrete and constant variables, the following information were given: group count (n), minimal value (min), maximal value (max), arithmetic mean ($\bar{X}$) and standard deviation (SD).
- Interquartile range (Q1–Q3; Q1 – the first quartile, Q3 – the third quartile) was not given in the characteristics of variables distribution due to small groups (n < 30, n – group count).
- Despite small groups, compliance of constant variables with normal distribution was verified, using the Shapiro-Wilk test (test's significance levels were not visible in the tables).
- In order to determine the importance of the differences between the two compared groups of independent variables with distribution in compliance with the norm, the t Student and Cochran-Cox tests were used. In the case of variables with distribution incompatible with the norm, present at least in one of the groups, U Mann-Whitney test was used.
- To determine the importance of differences between two compared groups of dependent variables with distribution in compliance with the norm, the t Student test was applied. In the case of variables with distribution incompatible with the norm, present in at least one of the groups, Wilcoxon Signed Ranks Test was used.

Acceptable occurence probability of a type I error (test's significance level) was 0.05 exact.

Results

The level of children's development met the requirements of the norms developed for child population in Szczecin.

The research showed that the arithmetic average values of the cervical kyphosis angle in girls from Grades 1–4 M were similar in comparison to peers from Grades 1–4 C, and had no significant statistical difference. In the second study (II) of girls from Grade 3 C, statistically significant development of the cervical kyphosis compared to the first study (I) was found. There were no such dependencies in the remaining Grades 1–4 M and 1–3 C (Table 5).

In both studies, the average values of the cervical kyphosis angle in boys from Grades 1–4 M were similar compared to peers from Grades 1–4 C. In the second study, the average values of the cervical kyphosis angle in boys from Grades 3 M, C and 4 M, C have statistically decreased since the first study, which indicates that the cervical kyphosis has significantly increased (Table 6).

With the exception of Grade 1 (M), girls in Grades 2, 3 and 4 M had a developed lumbar lordosis compared to peers from control groups (C), but a statistically significant difference was found only between Grades 3 M and 3 C. In the second study, the average arithmetic means of the lumbar lordosis angle were comparable. In girls from Grades 2 and 3, the average values of the lumbar lordosis angle decreased statistically since the first study, suggesting the progression of the lumbar lordosis (Table 7).

In the case of boys from Grades 1–4 M, the average values of the lumbar lordosis angle were comparable to peers from Grades 1–4 C in both studies. In the second study, boys from Grades 1 C and 4 M had statistically lower average values of the lumbar lordosis angle in comparison to the first study. In the second study, the average values of lumbar lordosis angle in the remaining Grades 1–4 M and C have not changed significantly when compared to the first study (Table 8).

Individual research showed proper posture in the sagittal plane in total of 62% of girls in music oriented classes and 73% from controls. Rounded back posture was characteristic for 31% of girls in music oriented classes and 14% of controls, as well as 25% and 16% of boys respectively. Flat back posture, on the other hand, was found in 6% of girls in music oriented classes and 12% controls, and in boys respectively 6% and 13%. The above-mentioned data suggests that posture defects were more common among children in music oriented classes, and less frequently in boys than girls (Tables 9 and 10).

Table 5. The lumbar lordosis angle [°] of the body of the girls in Grades 1–4 in the Primary School Complex no. 2 in Szczecin

Grade	Distribution characteristics	Study I		Study II		Study I *vs* Study II	
		M	C	M	C	M	C
1	n	12	14	12	14		
	min–max	141.6–169.7	147.2–168.2	136.9–166.9	134.0–164.0		
	mediana	154.4	156.4	149.4	157.8		
	$\bar{X}$ (SD)	155.3 (8.6)	157.8 (6.0)	151.0 (7.4)	154.2 (9.5)		
	p	0.44		0.12		0.06	0.18
2	n	12	12	12	12		
	min–max	143.6–167.7	138.9–164.6	142.1–164.0	144.6–166.6		
	mediana	153.5	155.4	152.7	156.3		
	$\bar{X}$ (SD)	155.1 (7.0)	154.9 (8.0)	153.3 (6.7)	155.3 (7.7)		
	p	0.96		0.54		0.31	0.67
3	n	13	16	13	16		
	min–max	147.3–166.3	140.9–168.1	141.1–165.5	137.4–159.4		
	mediana	153.4	157.4	153.4	151.6		
	$\bar{X}$ (SD)	154.3 (5.3)	156.2 (7.6)	153.3 (6.5)	150.1 (7.0)		
	p	0.42		0.20		0.18	0.015
4	n	14	15	14	15		
	min–max	135.7–169.9	142.2–165.5	138.5–168.2	136.9–161.5		
	mediana	156.7	158	154.3	147.8		
	$\bar{X}$ (SD)	155.9 (8.0)	156.2 (8.6)	154.0 (7.3)	148.4 (7.3)		
	p	0.92		0.06		0.26	0.09

Class: M – music, C – controls.

min – minimal value, max – maximal value, $\bar{X}$ – the arithmetic mean, SD – standard deviation, p – significance level.

Table 6. The lumbar lordosis angle [°] of the body of the boys in Grades 1–4 in the Primary School Complex no. 2 in Szczecin

Grade	Distribution characteristics	Study I		Study II		Study I *vs* Study II	
		M	C	M	C	M	C
1	2	3	4	5	6	7	8
1	n	12	13	12	13		
	min–max	145.0–160.9	133.2–169.1	146.4–161.0	146.4–175.1		
	mediana	156.8	154.6	152.2	154.6		
	$\bar{X}$ (SD)	156.0 (4.5)	154.0 (9.8)	153.7 (4.9)	155.1 (8.5)		
	p	0.63		0.97		0.27	0.96

1	2	3	4	5	6	7	8
	n	12	12	12	12		
	min–max	145.5–161.3	140.0–163.4	144.4–163.8	140.6–167.1		
2	mediana	153.3	155.4	152.4	153.2		
	$\bar{X}$ (SD)	153.2 (4.7)	154.9 (6.5)	152.6 (4.6)	152.7 (7.3)		
	p	0.48		0.64		0.37	0.88
	n	12	15	12	15		
	min–max	140.2–159.9	147.5–162.1	134.1–174.5	137.4–158.9		
3	mediana	155.90	152.0	150.10	146.70		
	$\bar{X}$ (SD)	153.7 (5.8)	153.5 (4.3)	150.8 (9.6)	148.4 (6.0)		
	p	0.90		0.43		0.003	0.003
	n	14	16	14	16		
	min–max	142.4–163.6	144.8–169.4	137.7–159.5	137.4–158.7		
4	mediana	155.6	155.0	151.4	150.4		
	$\bar{X}$ (SD)	153.9 (7.4)	157.2 (7.7)	149.5 (6.1)	149.4 (6.8)		
	p	0.30		0.98		0.013	0.005

Class: M – music, C – controls.

min – minimal value, max – maximal value, $\bar{X}$ – the arithmetic mean, SD – standard deviation, p – significance level.

Table 7. The lumbar lordosis angle [°] of the body of the girls in Grades 1–4 in the Primary School Complex no. 2 in Szczecin

Grade	Distribution characteristics	Study I		Study II		Study I *vs* Study II	
		M	C	M	C	M	C
	n	12	14	12	14		
	min–max	146.8–183.0	134.8–177.3	136.4–175.2	134.8–171.9		
1	mediana	165.1	154.7	153.7	154.6		
	$\bar{X}$ (SD)	164.6 (11.3)	155.3 (12.4)	154.2 (12.1)	151.6 (11.2)		
	p	0.07		0.60		0.06	0.24
	n	12	12	12	12		
	min–max	142.4–183.5	147.3–178.5	139.4–170.4	144.9–174.9		
2	mediana	164.9	170.6	155.0	151.9		
	$\bar{X}$ (SD)	161.9 (12.5)	168.1 (9.5)	157.0 (9.8)	156.7 (12.6)		
	p	0.25		0.95		0.17	0.012
	n	13	16	13	16		
	min–max	138.3–174.9	141.1–179.7	141.2–202.7	133.9–169.1		
3	mediana	152.8	166.6	152.8	153.9		
	$\bar{X}$ (SD)	152.7 (7.9)	163.8 (10.8)	152.7 (7.9)	153.6 (11.7)		
	p	0.003		0.63		0.24	0.047
	n	14	15	14	15		
	min–max	132.0–167.8	141.7–168.2	133.3–165.8	142.2–165.5		
4	mediana	154.5	165.2	151.9	154.5		
	$\bar{X}$ (SD)	152.6 (10.6)	159.6 (9.8)	151.6 (9.8)	154.1 (8.4)		
	p	0.07		0.50		0.62	0.21

Class: M – music, C – controls.

min – minimal value, max – maximal value, $\bar{X}$ – the arithmetic mean, SD – standard deviation, p – significance level.

Table 8. The lumbar lordosis angle [°] of the body of the boys in Grades 1–4 in the Primary School Complex no. 2 in Szczecin

Grade	Distribution characteristics	Study I		Study II		Study I *vs* Study II	
		M	C	M	C	M	C
1	n	12	13	12	13		
	min–max	138.8–183.8	138.7–214.8	142.2–174.5	133.4–168.6		
	mediana	161.8	167.7	154.8	152.9		
	$\bar{X}$ (SD)	164.2 (13.6)	167.7 (21.6)	157.3 (12.4)	152.1 (9.8)		
	p	0.65		0.30		0.09	0.038
2	n	12	12	12	12		
	min–max	146.9–175.9	144.2–182.3	145.3–169.7	143.0–179.9		
	mediana	160.2	161.1	152.8	153.9		
	$\bar{X}$ (SD)	160.0 (7.1)	162.8 (11.9)	155.4 (7.7)	156.9 (11.5)		
	p	0.49		0.71		0.18	0.06
3	n	12	15	12	15		
	min–max	147.3–167.6	142.8–174.2	135.5–214.2	140.4–212.2		
	mediana	151.9	157.9	160.1	158.2		
	$\bar{X}$ (SD)	153.3 (6.2)	156.5 (7.8)	160.3 (20.1)	163.0 (19.6)		
	p	0.26		0.87		0.26	0.26
4	n	14	16	14	16		
	min–max	133.6–164.8	136.8–176.2	133.6–160.3	137.1–161.9		
	mediana	155.4	157.9	150.4	153.8		
	$\bar{X}$ (SD)	153.3 (9.4)	157.5 (9.9)	149.1 (8.2)	152.2 (8.2)		
	p	0.30		0.38		0.039	0.44

Class: M – music, C – controls.

min – minimal value, max – maximal value, $\bar{X}$ – the arithmetic mean, SD – standard deviation, p – significance level.

Table 9. The frequency of occurrence of correct and incorrect postures in the sagittal plane in study I of girls from Grades 1–4 of music and control classes in the Primary School Complex no. 2 in Szczecin (%)

Rounded-concave back		Flat back		Rounded back		Concave back		Proper posture	
M	C	M	C	M	C	M	C	M	C
1	2	6	11	14	6	17	8	62	73

Class: M – music, C – controls.

Table 10. The frequency of occurrence of correct and incorrect postures in the sagittal plane in study I of boys from Grades 1–4 of music oriented and control classes in the Primary School Complex no. 2 in Szczecin (%)

Rounded-concave back		Flat back		Rounded back		Concave back		Proper posture	
M	C	M	C	M	C	M	C	M	C
2	–	4	12	12	10	10	7	71	74

Class: M – music, C – controls.

Discussion

Incorrect posture of school children is responsible for the development of degenerative changes of the spine, functional disorders, worse motor skills performance, and ultimately, the quality of life. A large impact in causing incorrect posture may lie in various external conditions, including: limited physical activity, prolonged sitting position at unadapted school desks, long-hour classes held in forced positions. These factors effect in increasing spine pain syndromes among young people (Drozda and Lewandowski 2011; Drozda et al. 2011; Nowotny et al. 2011).

As long as the issue of physical development of children, their motor or physical efficiency, or body posture, is widely described in the literature, these issues have not been touched on when it comes to children from music schools. A few reports related to the efficiency and attitude of children from music schools mainly concern the population in Poland, and this research theme was addressed, inter alia, by the following authors: Ślężyński et al. (1978), Gedl-Pieprzyca (2001), Demczuk-Włodarczyk E. et al. (2002), Kluszczyńska (2003), Gregosiewicz et al. (1990), Bubka and Poznańska (2000), Bittner-Czapińska and Janiszewski (2004), Janiszewski et al. (2002), Jankowicz-Szymańska (2009). The available literature, however, lacks foreign authors dealing with posture defects or motor skills efficiency of children from music schools at an early stage of education. As a result, the comparison of the research's results with those of other authors might be quite problematic. A few references in the world's literature mainly concern adults, students, and professional musicians (Dupuis 1993; Liu and Hayden 2002; Burkholder and Brandfonbrener 2004; Foxman and Burgel 2006; Storm 2006; Fidyk 2009; Wilke et al. 2011).

The level of physical development of children in the Primary School Complex no. 2 in Szczecin was within acceptable levels of the standards provided for the child population of the city of Szczecin (Umiastowska et al. 2001). The average values of growth and body weight of boys and girls, especially in control groups, were similar to the average obtained in the study of the child population of Poznań (Lewandowski 2006), Warmian-Masurian Voivodship (Mrozkowiak 2010), and Poland (Stupnicki et al. 2003).

The key element of the evaluation of music and general profile class children was the assessment of the body posture. There have been several attempts to determine the normative ranges of physiological curvatures of the spine, specific to individual populations of Polish children (Dziewulski and Szymanik 2003; Zeyland-Malawka 2003). Due to the variety of measurement techniques used in the cited publications, research results cannot be fully comparable with the results of other authors.

Łubkowska (2003) in her study of 1223 children from Szczecin, conducted in 1997, developed normative ranges of physiological curves using the electronic spherosomatograph. However, no normative ranges of physiological curves have been yet developed for children of Szczecin, based on the body surface topography using photogrammetric techniques. Consequently, the results of the individual research were referred to the normative ranges developed by Mrozkowiak (2010), using the above-mentioned method – a study of 2361 children from the Warmian-Masurian Voivodship. Since the establishing of clear boundaries between the proper and improper posture in the sagittal plane is impossible (Krawański 1992), the above-mentioned normative ranges represent the area of variation values that occur most frequently (66.66%), and only allow for its approximate evaluation (Mrozkowiak 2010; Łubkowska 2003).

Among the youngest girls and boys, in grades 1 and 2 M, C for example, no significant differences in the incidence of abnormal values were found. This is probably due to the fact that children at an early stage of education spend little time practicing musical instruments. In earlier stage school years (1–3), music classes were 30 minutes long, twice a week; in later school years (4 and above), classes were 45 minutes long, twice a week. While at home,

younger children practiced for about 30–60 minutes a day including rest periods, whereas older pupils usually spend 60–120 min. practicing. Similar practice time was noted for the pupils of the First Level Music School in Tarnów (Jankowicz-Szymańska et al. 2009). Over one year period, older pupils spent a total of approximately 600 hours, which in turn may significantly overload the locomotor system.

On the other hand, pupils from music profile school classes 1–3 of the Primary School Complex no. 2 in Szczecin attended other, physically active, rhythmic classes, which were all about physical exercise and rhythmical games with elements of artistic gymnastics, with the accompaniment of music. Fine motor movement/music classes develop jumping abilities, limberness, overall fitness and posture (Bubka 2009). In addition, students of 1–3 music oriented classes from the above-mentioned school took part in the preventive swimming classes in the nearby swimming pool during one of the three hours of fine motor skills classes within the framework of the integrated education at school. The need to implement this form of the locomotor system prevention among music high school students was discussed by Geld-Pieprzyca (2001).

Posture defects, less physical activity, obesity, and numerous aches among musicians playing various instruments are gaining importance in both the medical community and individuals connected to physical as well as music education and preventive treatment. This issue has been raised by numerous researchers, while stressing the major role of prevention, teacher education, and preparation of preventive exercises at any stage of education (Dupuis 1993; Chamagne 2003; Yawn et al. 1999; Knuessel and Jelk 1994; Wilczyński 2007; Steinmetz et al. 2010). Being increasingly discussed, these observations become a significant source of information, especially in the absence of available research on children at the early stage of music education. No sets of preventive exercises for music class children that would enable more efficient development of instrument playing technique have been found. Studies of Kava et al. (2010) conducted in the US among the instrumental faculty students showed that the introduction of physical exercise, based on the above assumptions, as well as Pilates exercise system, has a positive impact on the effectiveness of playing instrument.

In the majority of available publications, it is generally concluded that the implementation of preventive exercises and increased physical activity during classes has a great impact on improving wrong postures and reducing pain. A 10–15-minutes-walk is suggested after each hour spent practicing an instrument. It is also necessary to see that there is a suitable equipment in primary schools, which then reduces the percentage of children with wrong posture (Yawn et al. 1999).

A few authors dealing with the health issues of musicians (students and adults) confirm the existence of posture defects in cellists, accordionists, and instrumentalists playing stringed, woodwind, and percussion instruments. Studies conducted by Bittner-Czepińska and Janiszewski (2004), discovered a much more frequent occurrence of posture defects and the lateral curvature of the spine in accordionists, which required corrective exercise during their music education period.

According to Dupuis (1993), musculoskeletal disorders in the form of tendonitis, dystonia, carpal tunnel syndrome, or thoracic outlet syndrome, are the result of overloading of the muscular apparatus and ligament system. Spine aches (“back”) are in turn the result of overloading due to the long, forced body position during practice and concerts. This view is also shared by Chamagne (2003), Baadjou et al. (2011), and Krapac (2001). Steinmetz et al. (2010) found that in 93% of the musicians (significant changes were mostly observed in women) there is an incorrect posture stabilization (postural stabilization system disorders), including 85% of the changes around the blades, 71% of pelvic/lumbar area, and 57% of the so-called “upper crossed syndrome” (shoulder girdle crossed

syndrome) as a sign of the muscle dystonia. The research subjects included musicians playing stringed, woodwind, and percussion instruments, suffering from the musculoskeletal system aches. The author also stressed the utmost importance of appropriate prevention, treatment, and rehabilitation.

Baadjou et al. (2011) have noted that the musicians playing wind instruments in a forced sitting position have posture defects, and their energy consumption while playing is therefore proportionately bigger. Krapac (2001), on the other hand, dealt with the unphysiological body posture, particularly, the cervical region, shoulder girdle, forearms, and wrists, in musicians, noting changes in the shoulder and elbow joints, which were the symptoms of an overload. Similar changes were visible among the evaluated textile and furniture industries employees.

I believe that the purposefulness of screening, especially in music schools, is extremely important.

Conclusions

1. Physiological spinal curvatures of children in music oriented classes were more serious in comparison with peer controls.

2. Posture defects were more common in girls in music oriented classes, compared to controls.

3. Posture defects incidence among male students of music oriented and control classes were similar.

4. The national curriculum program of study for PE in music oriented classes should be modified and supplemented with exercises strengthening trunk muscles and increasing the range of motion in the shoulder and pelvic girdles.

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