THE EVALUATION OF MOTOR SKILLS OF I–IV GRADE MUSIC-ORIENTED MALE STUDENTS IN PRIMARY SCHOOL COMPLEX NO 2 IN SZCZECIN

Krzysztof Wilk,[1, A, B, C, D, E] Paweł Eider[1, C, D, E]

[1] Faculty of Physical Culture and Health Promotion, Szczecin University, Poland
[A] Study Design; [B] Data Collection; [C] Statistical Analysis; [D] Manuscript Preparation; [E] Funds Collection

Address for correspondence:
Krzysztof Wilk
Szczecin University, Faculty of Physical Culture and Health Promotion
Al. Piastów 40B, bl. 6, 71-065 Szczecin, Poland
Phone: +48 91 444 27 95
E-mail: krzysztof.wilk@univ.szczecin.pl

Abstract. The aim of the research was to establish the motor efficiency of boys between the ages of 7 and 10 years, attending Grades 1–4 of music oriented and general education classes.

The research material included 106 boys aged 7–10 of the Primary School Complex No. 2 in Szczecin. There were 50 children examined in the music oriented classes, and 56 in control group.

The research was conducted twice in the school year 2006/2007, including the same research material – first in September 2006, second in June 2007 accordingly. To evaluate the level of motor skills the EUROFIT European Fitness Test was used. Test results were statistically analyzed.

The Utenberger's test resulted in statistically significant better results of boys from the Grade 1 of control group (C) compared to their peers from Grade 1 of music oriented classes. In research II, only boys of Grades 1–2 M had statistically significant results improvement in the Utenberger's test in comparison with research I.

In research II, male students of Grades 1, 2, 3 M acquired statistically significant better results in the speed test of the upper limb than their peers of Grades 1 C, 2 C, 4 C. Moreover, in study II the subjected individuals of Grades 1 M, 2 M, 4 M and 4 C obtained statistically significant increase in their results in comparison with study I.

Trunk flexibility of male students from music-oriented classes and control group was in line; the same was true for the jump test. In study II, trunk flexibility and endurance in jumping insignificantly improved in all examined classes.

In the study, boys from Grade 4 M, obtained statistically more significant average hand strength results compared to their peers from Grade 4 C. In study II, boys from Grades 1 and 2 M obtained statistically significantly lower average values in this test in comparison with boys from Grades 1 and 2 C. In study II, unlike in study 1, there was a statistically significant improvement in the test results only in boys from Grades 3 and 4 M. In contrary, there was a statistically significant improvement of hand strength results in all grades of control groups compared to study I.

In trunk flexibility test, boys from Grade 1 M had statistically lower mean values than boys from Grade 1 C. In the same study, boys from grades 3 and 4 M had statistically significantly higher average values than their peers from Grades 3 and 4 C. In study II, statistically significant differences were found between Grades 3 M and 3 P as well as between 4 M and 4 P. In study II, in Grades 1 C and 2 M, there was a statistically significant results improvement compared to study I.

Functional capacity of boys from all subjected classes was similar in both studies. In study II, statistically significant improvement in this test was found only in Grade 2 M.

In agility fitness test, in study II, boys from Grade 4 M had statistically significantly better results opposed to Grade 4 C. It turned out that boys from grades 1 M, 2 M, and 3 C, had statistically significant results improvement in study II compared to study I. Based on the conducted studies, the following conclusions have been formulated:
Motor efficiency of boys from music-oriented as well as control classes was comparable.
Practicing musical instruments at the early education stage did not have any significant influence on the general motor efficiency of male pupils.
As part of preventive measures of degenerative overload changes of the motor system in music-oriented classes, the national curriculum program of study for PE should be modified and supplemented with exercises strengthening trunk muscles and increasing the range of motion in the shoulder and pelvic girdles.

Key words: motor fitness, physical fitness in musicians, musician health and safety

Introduction

The level of physical activity in children from music schools is not particularly low, but somehow limited. Despite the fact that the existing program of physical education is the same in all primary schools, in music-oriented classes it is limited by exercises which could cause injuries or overload of upper limbs (Bubka and Poznan 2000). In addition, a forced position while practicing an instrument and during concerts can lead to static and pain disorders (Larsson et al. 1993; Liu and Hayden 2002; Brandfonbrener and Burkholder 2004; Foxman and Burgel 2006). This fact may be relevant in assessing the level of motor skills of these children, even if the level of this efficiency is substantially genetically-related (Mleczko 1991; Bouchard and Shephard 1994), morphologically-related (Osiński 1998), or caused by environmental factors (Przewęda 1993; Orlicz 1996).

The aim of the research was to assess the motor efficiency of children aged 7–10 from music-oriented and general classes of the Primary School Complex No. 2 in Szczecin.

Material

The research material constituted of 106 boys aged 7–10 of the Primary School Complex No. 2 in Szczecin attending Grades 1–4 of music-oriented and general education classes. There were 50 boys examined in the music oriented classes, and 56 boys in general education classes accordingly (Table 1).

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

Grade	Class profile	
	music oriented	controls
	n	n
I	12	13
II	12	12
III	12	15
IV	14	16
All	50	56

Most numerous group consisted of boys from a piano class, followed by violin, guitar, flute, clarinet, cello, and percussion (Table 2).

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

Instrument	Boys	
	n	%
Piano	22	44.0
Violin	11	22.0
Guitar	8	16.0
Flute	3	6.0
Clarinet	1	2.0
Cello	2	4.0
Percussion	3	6.0
All	50	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 instead of age categories: 7, 8, 9, 10. 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).

Fitness evaluation test was conducted at the gym in the morning hours. Children wore a T-shirt, shorts, and trainers; the evaluation had been preceded by a regular 7–8 minute warm-up. The evaluation test used had a small possible complexity and minimum equipment requirements. European Fitness Test was used in the studies (Grabowski and Szopa 1991; Stupnicki et al. 2003), which is known to be of the highest accuracy and reliability (Chwała 1997 Szopa et al. 1998). This solution has eliminated the need to rereview internal relevancy of the utilized methods (Osiński 2003).

Motor efficiency was evaluated through the following indirect methods used in the EUROFIT test (Grabowski and Szopa 1991; Stupnicki et al. 2003):

1. General balance – standing for 1 min on a narrow strip in a 'flamingo position'.
2. Speed of upper limb movement – tapping in pulleys.
3. Trunk flexibility – forward bend in sitting position.
4. Explosive strength – the long jump.
5. Static strength – hand-held dynamometry (HHD).
6. Trunk strength – sitting upright from the lying position in 30 s.
7. Functional strength – the horizontal bar overhang.
8. Running speed – agility – shuttle run 10 × 5 m.

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 ($\overline{X}$) 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 Manna-Whitneya 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 Utenberger's test resulted in statistically significant better results of boys from Grade 1 of control group (C) compared to their peers from Grade 1 of music oriented classes. The results obtained in the remaining grades were comparable. In research II, only boys of Grades 1–2 M had statistically significant results improvement in the Utenberger's test in comparison with research I (Table 3).

Table 3. The Utenberger's test [n] of boys from grades 1–4 of 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
I	n	12	13	12	13		
	min–max	5–11	3–10	3–7	1–7		
	mediana	6	5	4.5	3		
	$\bar{X}$(SD)	7 (2.0)	5 (2.2)	5 (1.4)	3 (1.8)		
	p	0.07		0.028		0.009	0.013
II	n	12	12	12	12		
	min–max	3–11	3–10	0–8	1–8		
	mediana	7	6.5	5	5		
	$\bar{X}$(SD)	7 (2.7)	6.5 (2.1)	5 (2.4)	5 (2.2)		
	p	0.50		0.73		0.025	0.26
III	n	12	15	12	15		
	min–max	2–11	1–10	3–10	3–10		
	mediana	6	6	5.5	6		
	$\bar{X}$(SD)	6 (2.8)	6 (2.5)	5.5 (2.0)	6 (1.8)		
	p	0.75		0.29		0.91	0.91
IV	n	14	16	14	16		
	min–max	2–10	5–10	0–8	3–10		
	mediana	5.5	6.5	5.5	7		
	$\bar{X}$(SD)	6 (2.5)	7 (1.8)	5 (2.3)	7 (2.1)		
	p	0.24		0.08		0.16	0.50

Class: M – music, C – controls.
min – minimal value, max – maximal value, $\bar{X}$ – the arithmetic mean, SD – standard deviation, p – significance level.

In study I, in upper extremity reflex testing, boys from music oriented and general education classes had comparable results. In study II, on the other hand, statistically significantly better results were observed in boys from Grades 1, 2, 4 M compared to their peers from Grades 1, 2, 4 C. In addition, boys from Grades 1, 2, 4 M and Grade 4 C had statistically more significant results improvement compared to study I (Table 4).

Table 4. Upper extremity reflex testing [s] of boys from grades 1–4 of 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
I	n	12	13	12	13		
	min–max	15.4–24.5	16.2–22.9	13.2–19.3	13.6–20.5		
	mediana	17.6	18.9	16.7	19.4		
	$\bar{X}$(SD)	18.2 (2.4)	19.1 (1.8)	16.5 (1.8)	18.7 (2.1)		
	p	0.20		0.009		0.034	0.45
II	n	12	12	12	12		
	min–max	12.3–20.7	14.4–22.0	11.1–15.4	12.8–19.3		
	mediana	16.5	16.3	14.0	15.8		
	$\bar{X}$(SD)	16.3 (2.2)	16.8 (2.2)	13.8 (1.3)	15.8 (1.8)		
	p	0.55		0.005		0.012	0.10
III	n	12	15	12	15		
	min–max	11.3–16.6	11.81–21.20	11.87–15.98	11.92–18.83		
	mediana	14.5	14.75	15.00	15.45		
	$\bar{X}$(SD)	14.5 (1.5)	15.4 (2.5)	14.7 (1.3)	15.2 (1.8)		
	p	0.27		0.44		0.78	0.78
IV	n	14	16	14	16		
	min–max	11.2–17.1	13.8–22.4	8.8–17.3	12.0–20.0		
	mediana	14.4	15.9	11.5	14.0		
	$\bar{X}$(SD)	14.5 (2.0)	16.2 (2.4)	12.0 (2.2)	14.2 (2.1)		
	p	0.15		0.001		0.004	0.007

Class: M – music, C – controls.
min – minimal value, max – maximal value, $\bar{X}$ – the arithmetic mean, SD – standard deviation, p – significance level.

Trunk flexibility level was similar in both the musical and control classes. Statistically significantly better results in study I were achieved only by male students from Grade 4 M, at variance with their peers from Grade 4 C. The arithmetic means values of trunk flexibility in the remaining classes were comparable in the both studies. Furthermore, in study II, none of the subjected classes were characterized by statistically more significant results compared to study I (Table 5).

Table 5. Trunk flexibility [cm] of boys from grades 1–4 of 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
I	n	12	13	12	13		
	min–max	–7–7	–4–10	–4–8	–7–8		
	mediana	1.5	4	1	2		
	$\bar{X}$(SD)	0.9 (4.2)	3.6 (4.6)	1.4 (3.9)	2.2 (5.5)		
	p	0.17		0.70		0.64	0.18
II	n	12	12	12	12		
	min–max	–13–9	–7–5	–8–11	–2–8		
	mediana	1.5	1	3	2		
	$\bar{X}$(SD)	1.2 (5.4)	1.0 (3.6)	1.8 (5.6)	1.9 (3.3)		
	p	0.89		0.97		0.81	0.21

1	2	3	4	5	6	7	8
	n	12	15	12	15		
	min–max	–3–9	–13–10	–4–16	–13–15		
III	mediana	4.5	2	2.5	3		
	$\bar{X}$(SD)	3.6 (3.8)	0.3 (5.8)	3.4 (5.7)	0.6 (8.0)		
	p	0.10		0.31		0.72	0.72
	n	14	16	14	16		
	min–max	–10–9	–9–5	–7–9	–9–8		
IV	mediana	5	–2	2	1		
	$\bar{X}$(SD)	3.6 (5.1)	–2.1 (4.8)	1.9 (4.7)	1.2 (6.4)		
	p	0.007		0.18		0.09	0.48

Class: M – music, C – controls.
min – minimal value, max – maximal value, $\bar{X}$ – the arithmetic mean, SD – standard deviation, p – significance level.

Endurance in jumping test mean values in all classes were proportional. In study I, boys from Grade 4 M, contrary to Grade 4 C, achieved more statistically significant results. In study II, on the other hand, endurance jump test results were insignificantly better in all subjected classes (Table 6).

Table 6. Endurance in jumping [cm] of boys from grades 1–4 of 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	13	12	13		
	min–max	90–150	82–151	0–170	106–166		
I	mediana	117.5	115.0	133.0	128.0		
	$\bar{X}$(SD)	116.8 (19.0)	119.2 (23.2)	124.8 (43.1)	129.2 (19.8)		
	p	0.79		0.67		0.034	0.047
	n	12	12	12	12		
	min–max	85–156	90–170	78–177	100–155		
II	mediana	117.5	120.0	139.0	115.5		
	$\bar{X}$(SD)	120.2 (17.6)	119.8 (22.3)	137.2 (27.0)	123.3 (19.3)		
	p	0.97		0.16		0.017	0.97
	n	12	15	12	15		
	min–max	81–187	102–162	101–186	118–178		
III	mediana	148.5	138.0	156.5	143.0		
	$\bar{X}$(SD)	144.3 (27.9)	136.4 (17.3)	152.4 (22.7)	145.1 (16.3)		
	p	0.37		0.34		0.020	0.020
	n	14	16	14	16		
	min–max	113–170	90–160	125–177	102–180		
IV	mediana	155.0	135.0	156.0	150.0		
	$\bar{X}$(SD)	149.8 (17.4)	130.5 (22.0)	152.8 (15.2)	145.3 (23.7)		
	p	0.026		0.36		0.22	0.028

Class: M – music, C – controls.
min – minimal value, max – maximal value, $\bar{X}$ – the arithmetic mean, SD – standard deviation, p – significance level.

In study I, boys from Grade 4 M had statistically more significant mean values of hand strength than their peers from Grade 4 C. In study II, boys from Grades 1 and 2 M had statistically significantly lower mean values than

boys from Grades 1 and 2 C. In study II, a great improvement in the results of the strength test has been observed only in boys from Grades 3 and 4 M compared with study I. In all control classes in study II, on the other hand, statistically significant improvement in the results of hand strength test has been noted (Table 7).

Table 7. Hand strength [psi] of boys from grades 1–4 of 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
I	n	12	13	12	13		
	min–max	2–8	1–4	2–5	3–14		
	mediana	3.0	2.3	4.0	7.0		
	$\bar{X}$(SD)	3.8 (1.8)	2.5 (0.9)	3.7 (1.0)	7.4 (3.4)		
	p	0.09		0.008		1.00	0.008
II	n	12	12	12	12		
	min–max	2–5	1–5	1–5	3–12		
	mediana	3.3	3.0	3.3	5.0		
	$\bar{X}$(SD)	3.5 (0.9)	3.1 (1.1)	3.4 (1.2)	5.6 (2.8)		
	p	0.59		0.010		0.58	0.009
III	n	12	15	12	15		
	min–max	2–9	1–7	3–6	3–13		
	mediana	4.3	4.0	5.5	5.0		
	$\bar{X}$(SD)	4.6 (1.8)	4.0 (1.6)	5.0 (1.3)	5.7 (2.4)		
	p	0.37		0.91		0.007	0.007
IV	n	14	16	14	16		
	min–max	3–7	2–6	4–15	3–11		
	mediana	5.8	3.8	6.3	5.5		
	$\bar{X}$(SD)	5.6 (1.1)	4.2 (1.4)	7.2 (3.2)	6.1 (2.3)		
	p	0.007		0.51		0.035	0.012

Class: M – music, C – controls.
min – minimal value, max – maximal value, $\bar{X}$ – the arithmetic mean, SD – standard deviation, p – significance level.

In study I, boys from Grade 1 M had significantly lower mean values in trunk flexibility test in comparison with boys from Grade 1 C. In this very same test, boys from grades 3, 4 M achieved statistically more significant mean values than their peer from Grades 2, 4 C. In study II, statistically significant differences in the mean values observed between Grades 3 M and 3 P as well as 4 M and 4 P. In Grades 1 C and 2 M, there was a statistically significant improvement compared to study I (Table 8).

Table 8. Sitting upright from the lying position [n] in 30 s of boys from grades 1–4 of 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
I	n	12	13	12	13		
	min–max	11–21	17–26	12–24	0–23		
	mediana	18.5	21.0	20.0	18.5		
	$\bar{X}$(SD)	17.5 (3.5)	21.3 (3.3)	19.0 (3.3)	16.7 (6.6)		
	p	0.016		0.46		0.16	0.011

1	2	3	4	5	6	7	8
	n	12	12	12	12		
	min–max	13–25	11–30	11–29	16–28		
II	mediana	20.5	20.0	21.0	23.5		
	$\bar{X}$(SD)	19.8 (3.6)	19.7 (5.6)	21.7 (5.3)	22.6 (3.7)		
	p	0.99		0.57		0.045	0.07
	n	12	15	12	12		
	min–max	16–34	12–26	14–30	11–26		
III	mediana	24.0	18.0	25.5	19.0		
	$\bar{X}$(SD)	23.8 (5.0)	18.5 (3.7)	24.7 (4.9)	19.3 (4.2)		
	p	0.005		0.005		0.33	0.33
	n	14	16	14	16		
	min–max	22–31	17–25	22–29	17–25		
IV	mediana	26.0	22.0	25.5	22.5		
	$\bar{X}$(SD)	25.9 (2.3)	21.9 (2.6)	25.6 (2.1)	22.0 (2.9)		
	p	0.001		0.002		0.67	0.89

Class: M – music, C – controls.
min – minimal value, max – maximal value, $\bar{X}$ – the arithmetic mean, SD – standard deviation, p – significance level.

Functional strength measurements were similar in all classes in both studies. In study II, however, statistically significant improvement was observed only in Grade 2 M (Table 9).

Table 9. The horizontal bar overhang [s] of boys from grades 1–4 of 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	13	12	13		
	min–max	0–24.1	1.4–24.0	1.5–22.7	2.0–22.5		
I	mediana	5.3	7.5	7.0	6.5		
	$\bar{X}$(SD)	6.1 (6.4)	9.1 (6.9)	7.6 (6.0)	7.8 (6.1)		
	p	0.18		0.92		0.08	0.80
	n	12	12	12	12		
	min–max	0–23.5	2.6–55.7	1.9–49.9	2.3–41.0		
II	mediana	3.87	4.71	11.32	10.74		
	$\bar{X}$(SD)	5.8 (6.2)	11.6 (15.2)	15.9 (15.4)	13.9 (12.4)		
	p	0.20		0.89		0.015	0.48
	n	12	15	12	15		
	min–max	1.3–44.4	2.3–29.2	1.2–48.5	2.5–31.8		
III	mediana	10.8	9.5	11.2	9.7		
	$\bar{X}$(SD)	15.6 (13.6)	11.1 (8.3)	17.0 (14.3)	12.0 (9.0)		
	p	0.30		0.52		0.57	0.57
	n	14	16	14	16		
	min–max	1.2–28.2	1.8–16.4	1.0–36.6	1.0–35.4		
IV	mediana	12.3	6.6	11.8	8.1		
	$\bar{X}$(SD)	11.8 (8.3)	8.1 (5.1)	13.0 (11.1)	11.0 (10.6)		
	p	0.23		0.51		0.88	0.80

Class: M – music, C – controls.
min – minimal value, max – maximal value, $\bar{X}$ – the arithmetic mean, SD – standard deviation, p – significance level.

In agility tests in study I, all boys obtained equivalent results. In study II, though, boys from grade 4 M achieved statistically more significant results compared to Grade 4 C. It turned out that boys from Grades 1M, 2M, and 2P had statistically significant improvement in study II as contrary to study I (Table 10).

Table 10. Shuttle run 10 × 5 m [s] of boys from grades 1–4 of 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
I	n	12	13	12	13		
	min–max	22.8–31.1	22.2–32.5	22.8–31.1	19.1–32.5		
	mediana	27.4	25.9	24.0	27.9		
	$\bar{X}$(SD)	26.9 (3.1)	26.0 (3.5)	23.9 (1.9)	26.3 (3.9)		
	p	0.53		0.10		0.004	0.88
II	n	12	12	12	12		
	min–max	21.5–29.6	21.3–31.4	19.8–27.7	20.9–28.8		
	mediana	24.7	26.4	23.2	24.6		
	$\bar{X}$(SD)	25.1 (2.3)	26.6 (3.4)	23.5 (2.4)	24.3 (2.1)		
	p	0.22		0.38		0.034	0.015
III	n	12	15	12	15		
	min–max	18.8–28.2	12.4–28.6	19.4–24.7	19.8–25.3		
	mediana	22.4	21.0	21.9	22.0		
	$\bar{X}$(SD)	22.5 (2.35)	22.2 (3.83)	22.1 (1.68)	22.3 (1.72)		
	p	0.79		0.74		0.87	0.87
IV	n	14	16	14	16		
	min–max	21.3–25.1	21.0–31.6	13.5–24.4	22.0–26.1		
	mediana	23.6	24.6	22.1	24.1		
	$\bar{X}$(SD)	23.1 (1.4)	25.1 (3.7)	21.85 (2.7)	24.1 (1.3)		
	p	0.24		0.007		0.25	0.65

Class: M – music, C – controls.
min – minimal value, max – maximal value, $\bar{X}$ – tthe arithmetic mean, SD – standard deviation, p – significance level.

Discussion

Wrong conditions in the case of children from music oriented classes, which include: physical activity decrease, prolonged sitting position in ill-adapted school desks, long hours of school classes in forced positions, can lead to functional disorders, motor efficiency decrease, and finally, the quality of life. This resulted in continuously increasing occurrence of spinal pain syndrome in young people (Drozda and Lewandowski 2011; Drozda et al. 2011; Nowotny et al. 2011). 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, Knuessel and Jelk 1994, Ohtsuka et al. 1998, Yawn et al. 1999, Chamagne 2003, Steinmetz et al. 2010) Musculoskeletal system fatigue results in the decrease of physical functions and capacity of suffering individuals. Very important aspects in this case, both from medical (treatment availability) and economical perspective (treatment costs), include preventive measures and common examinations aimed at detecting abnormalities in motor organs (Grivas et al. 2007, Baadjou et al. 2011, Permoda 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 posturę 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).

Utilized in the research Eurofit fitness test is valued by researchers all around the world and here in Poland (Szopa et al. 1996; Jürimäe et al. 2007; Raczek 2010; Perotta et al. 2011; Armstrong et al. 2011; Cepero et al. 2011). A battery of Eurofit test is standardized, what allows for the evaluation of motor and physical efficiency of children, young people, and adults of both sexes; it is a step towards the unification of evaluation methods on a European and international scale (Osiński 2003) since the Eurofit test had been used not only in Europe but also worldwide. Research conducted in South Africa is a good example of this as it showed that Caucasian children were characterized by a higher fitness level than their peers of black and mixed-race origins (Armstrong et al. 2011).

Motor efficiency was generally comparable In both the music oriented and control classes. In some tests, e.g. upper limb reflex test, hand strength, trunk flexibility, children from music oriented classes scored better results, in other tests they did worse.

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).

Bubka and Poznańska (2000), in their studies conducted in Cracow music schools on 560 children aged 7.5–14.5, used tests proposed by Szopa, Raczek and Mynarski, to evaluate fitness and physical exercise capacity. The following capacities were measured:

– strength; utilizing static strength test (thrust force of arms and shoulders in kg),

- speed; utilizing explosive strength test (long jump from standstill) and hand reflex test („plate tapping" test),
- endurance; Maxima oxygen uptake VO_2max (modified Margarii test),
- coordination; receptor on motor coordination (utilizing cross apparatus), whole body reflex test (3 m forward bend run), balance (walking a Fleishman balance beam), sensory reception (the feeling of time by movement observation), the flow of movement (cyclical repetition of movements in the form of leaps).

The research showed that both boys and girls from music schools got much better results in the hand flexibility and reflex tests than their peers from general education schools. In the remaining tests, those, for example, indirectly assessing static and explosive strength, children from music schools and from general education institutions had comparable results. In children from music schools, however, weaker physical efficiency and worse body posture has been observed. The research conclusion mainly involves the idea of introducing mandatory changes to the curriculum of music schools. In independent research, similar results mainly involved boys. In the case of functional strength or agility tests, boys from music oriented classes results alternated between the better and worse results within groups. In children of the Lithuanian, Latvian and Scandinavian origin, Eurofit tests demonstrated greater motor efficiency of boys than girls, appropriately to their age and BMI, the so-called 'musical' children were not separated as an independent group (Ekblom et al. 2005; Jürimäe et al. 2007; Volbekiene 2007).

By analyzing the results of motor efficiency tests conducted during the school year in individual research, it was concluded that there were frequent minor improvements, or they remained the same. Perhaps this was affected by the increase in children's level of physical development. In parallel tests, Spanish authors observed the improvement of control tests' results in primary school children, having proved that PE classes should be held much more frequently than three times a week (Cepero et al. 2011).

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.

Conclusions

1. Motor efficiency of boys from music-oriented as well as control classes was comparable.

2. Practicing musical instruments at the early education stage did not have any significant influence on the general motor efficiency of male pupils.

3. As part of preventive measures of degenerative overload changes of the motor system in music-oriented classes, the national curriculum program of study for PE 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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