



Research Article

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Deviations of Posture in Children in Primary Music School; Is It Connected with Playing Music Instrument or Physical Activity?



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Abstract

The postural quality and status of muscles and bones during musical performance affect the health of musicians. In this research, we examined the body posture of 74 students at a Primary music school in Bosnia and Herzegovina. Data on postural status were obtained through posture analysis, measurement and assessment of music school students, and the general level of physical activity was assessed using a physical activity questionnaire. The most common postural defects, asymmetries and level of physical activity were identified. It was concluded that most students have a physiological posture, a statistically significant correlation was established between the results on the sociometer and the physical activity of the students - students who are less physically active on average have scoliotic posture. We hope that using the results of this study will help prevent postural deformities in children in music schools.

Keywords: Posture; Primary Music School; Physical Activity; Children

Introduction

Students at music schools are very talented children, 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 [1]. Such children are exposed to all sorts of disorders of the statics of the body and the asymmetries of the shaping of the trunk [2,3]. This is substantially affected by the forced position of the body during practice and concerts [4-6]. Lahme [7] defines the physiological posture of the body during musical performance as that in which the total load is evenly distributed among muscles and ligaments, and which cordingly "should approximate as closely as possible the correct posture without any instrument." Due to their unique role and conditions, music students are at higher risk of playing-related musculoskeletal pain, as compared with their peers involved in other disciplines [8]. Previous studies have also suggested that musicians' health-promoting behaviors, including engagement with physical activity, are limited [9-13]. A lack of physical activity, especially when combined with stressful working environments that

encourage long periods of practice and competition, can lead to negative health consequences including locomotion and musculoskeletal problems [14-16]. 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 [17-20]. Considering the potential importance of any impact of posture on the health and performance of musicians, and considering the shortcomings of previous research, in this study we aimed to

- i. Assess physiological posture in music student
- ii. Measure possible bilateral differences in the lower and upper extremities
- iii. Carry out The Physical Activity Questionnaire (PAQ) and check its connection with the student's posture

iv. Determine if there is a connection between posture deviation and music playing.

Materials & Methods

The aim of the study was to determine whether there were posture defects in the sagittal and frontal plane of the trunk in children (N=74) aged 8 - 15, attending Grades 1-6 the Primary music school in Ljubuški (Bosnia and Herzegovina). Members of the School Head Office and the 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 Ministry of Science, Culture and Sports and the Ethics Committee. 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 [21]. It is performed a visual assessment of the static posture according to the recommendation International Society for Posture and Gait Research [22] and after that measured the rotation of the trunk with a scoliometer [23] and the bilateral difference of the extremities with a centimeter. International Society for Posture and Gait Research indicated that from a time of visual assessment of posture of 25-40 s, the posturographic parameters are stable and reliable and that a reasonable duration could be 30 s with 5 s of adjustment time before starting the assessment. The scoliometer has been used as a tool (used alone with the Adams forward bend test) in terms of reliability and validity to measure trunk asymmetry [24]. Scoliomeric measurements in the sitting position were used in patients who have a significant discrepancy in leg length.

After the measurements and assessment, the music school students filled out The Physical Activity Questionnaire (PAQ-C). PAQ-C provides a reliable and valid measure of general physical activity levels in children during the school year [25,26]. PAQ-C is based on questions for the last seven days and requires participants to check a list of activities, as far as frequency is concerned, by using the following scale: ‘None’, ‘1-2 times per week’, ‘3-4 times’, ‘5-6 times’, ‘7 times or more’. The other questions cover ‘physical activity in PE lessons’, ‘recess’, ‘lunch time’, ‘right after school’, and ‘evenings’, as well as ‘the last

weekend’. A five-scale measure of frequency of participation is given for each question.

Results

Statistical analysis

The collected data were formed into a database using the computer program Microsoft Excel and statistical processing was done with the computer program SPSS 10.0 (SPSS for Windows, SPSS Inc. Chicago IL, USA). Before the actual analysis of the results, the distribution of the results on the main outcome measures was checked using the Kolmogorov-Smirnov test. The distribution of results on all variables deviates significantly from normal ($p<.05$), therefore, non-parametric procedures were used while testing the hypotheses. The data were processed using descriptive statistic methods, where categorical variables were presented as frequency and percentage, while continuous variables were presented through the arithmetic mean and standard deviation. The difference between the mean values of continuous variables in independent samples was examined by the Mann-Whitney u test. Spearman’s correlation coefficient was used to determine the connection between variables. The level of statistical significance in the survey is 5% with a reliability of 95%.

Participants

A total of 74 students participated in this research and the group consisted of 21 (28.4%) males, and 53 (71.6%) females. The youngest student was 8 and the oldest one was 15 years old, whilst the average age was 12.12 (sd=2.11). A total of 67 (90.5%) students were right-handed, while 7 (9.5%) were left-handed. Average Height in this survey was 159.6 cm (sd=12.69 min=129, max=187), while the average weight of students was 50.68 (sd=13.11, min=28, max=77). Average length of the weekly instrument playing in this survey was 6.25 h (min=1, max=17, sd=3.37). The most played instrument among students was piano (N=30 or 40.5%), followed by guitar (N=18 or 24.3%) and flute (N=13 or 17.6%). A slightly smaller number of students in this survey played violin (N=7 or 9.5%), and harmonica (N=4 or 5.4%) and the least of them played trumpet (N=2 or 2.7%) (Tables 1,2).

Table 1: Deskriptiva parameter od Anthropometric measurements with regard to the type of body posture (N=74).

Antropometric measurements	Body Posture													
	Normal		Scoliosis		Kyphosis		Lordosis		Flat back-lordosis		Kyphosis-lordosis		Flat back	
	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd
Length of the right leg	77.88	8.54	78.08	7.48	85	5.94	80.75	0.35	81	-	79	-	85	7.07
Length of the left leg	75.69	8.77	7.17	7.53	85	5.94	80.75	0.35	81	-	79	-	85	7.07
Length of the right arm	68.87	6.46	72.63	4.99	80.78	6.13	76	1.41	82	-	75	-	80.75	5.3
Length of the left arm	68.66	6.55	72.64	5	80.7	6.03	76.15	1.63	82	-	75	-	80.8	5.37
Length of the right hand	16.4	1.78	17.82	1.95	18.13	1.11	17	0.71	19.5	-	17.2	-	17.55	1.48

Length of the left hand	16.4	1.78	17.97	2.03	18.18	1.14	17.1	0.85	19.6	-	17.6	-	17.45	1.48
Right arm circumference	24.18	2.88	23.67	2.94	27.1	0.97	25.1	5.02	22.6	-	22.5	-	24.05	0.78
Left arm circumference	24.14	2.89	23.18	1.9	26.38	2.5	23	7.1	29	-	21	-	25.75	5.3

Table 2: Differences in the type of posture regarding the years of music school (N=74).

Years of music school		N (%)	Md	Man Whitney	Z	p
Posture	Normal posture	49 (66.22%)	4	560	-0.609	0.543
	Improper posture	25 (33.78%)	3			

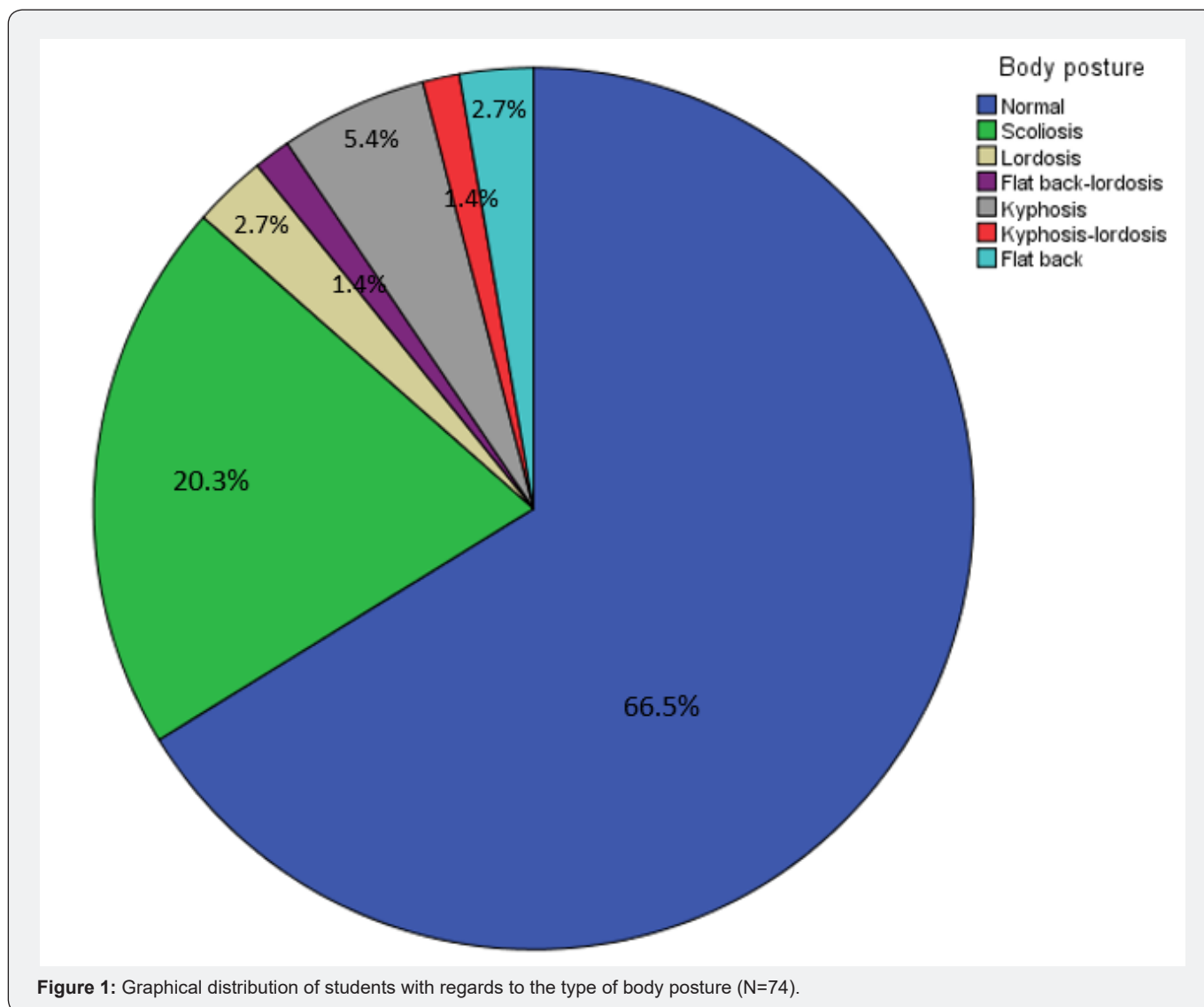


Figure 1: Graphical distribution of students with regards to the type of body posture (N=74).

Most music school students in this research have a normal body posture (N=49 or 66.2%), followed by those who have scoliotic body posture (N=15 or 20.3%), and the least of them (only one) have flat back-lordosis (1.4%) and kyphosis-lordosis posture (1.4%). The graphical distribution of students with regards to the type of body posture is shown in Figure 1.

The correlations between improper posture of music school students and years of playing an instrument and the level of

physical activity was not statistically significant. The correlation between years of playing an instrument and physical activity was significant. Students who have been in music school longer are on average less physically active. A statistically significant correlation is found between results on scoliometer and physical activity of students - students who are less physically active, on average, have higher results on the scoliometer. The correlations are depicted in Table 3. The correlation between results on scoliometer, height, weight, sex of students and length

of the weekly instrument playing was not statistically significant (p>.05).

Table 3: Correlations between physical activity, years of playing instrument, age, improper posture and results on scoliometer (N=74)

Spearman's rho	1	2	3	4	5
1. Physical activity	-	-.262*	0.04	-0.128	-.336**
2. Years of playing instrument		-	.908**	-0.071	0.075
3. Age			-	-.063	0.04
4. Improper posture				-	.508**
5. Scoliometer					

**p<.001

Discussion

In the available literature, there are no authors dealing with posture disorders or motor efficiency of music school children in the early stages of education [1]. Therefore, comparing the results of the research with the results of other authors could be quite problematic. References in the literature mainly refer to adults, students and professional musicians [10-14,27]. If the issue of children's physical development, their motor or physical efficiency or body posture is extensively described in the literature, these issues have not been investigated when it comes to children in music schools [1,28]. Several reports on the effectiveness and attitude of children from music schools [2,29,30].

Unfortunately, most of the musician's posture literature, whether focused on health or performance, appears methodologically weak. In a review of 42 empirical studies on the influence of posture on health and musical performance published between 1972 and 2012, Blanco Pinheiro [28] concludes that, despite the growing interest in this topic, its empirical basis is still shaky, the main weaknesses arising from

the small size of the samples, their great heterogeneity with regard to age, musical instrument and musical level, and the similarly great heterogeneity of the instruments and procedures used to measure postural quality. Our research is focused on children in primary school who also attend primary music school, are engaged in music and additionally study, and are most often physically insufficiently active. All the above represents an additional risk for the development of postural deformities. Our results show that 33.8% of students have some form of postural deviation, of which 20.3% have scoliotic bad posture.

Improper posture at school age is responsible for the development of degenerative changes in the spine, functional disorders, weaker motor skills, and ultimately the quality of life [31]. Various external conditions can have a major impact on the occurrence of improper posture, including limited physical activity, long-term sitting in inappropriate school desks, long-term teaching in forced positions. These factors influence the increase of spine pain syndrome in young people [31,32]. Table 4 shows how many hours per week children spend in elementary music school, 140 hours in the first two grades, 210 hours each in grades 3-6, and an additional 70 hours in the sixth grade.

Table 4: Curriculum in Primary music school [38].

Curriculum	Number of Hours Per Week					
	Class					
	I.	II.	III.	IV.	V.	VI.
Mandatory						
Subjects						
Basic subject	2 (70')	2 (70')	2 (70')	2 (70')	2 (70')	2 (70')
Solfeggio	2 (70')	2 (70')	2 (70')	2 (70')	2 (70')	2 (70')
Collective music making			2 (70')	2 (70')	2 (70')	2 (70')
IN TOTAL	4 (140')	4 (140')	6 (210')	6 (210')	6 (210')	6 (210')
Electoral						
Subjects						
Piano						1 (35')
Music theory						1 (35')

Physical activity includes any body movement caused by skeletal muscle contractions that increase energy consumption and plays an important role in children's development and is a strong indicator of their health and posture. Based on these benefits, the World Health Organization and the American Society for Health and Physical Education recommend that children and adolescents spend at least one hour per day of moderate-to-vigorous activity [33,34,35]. Already in adolescence, the level of physical activity begins to decrease, which is confirmed by the results of longitudinal studies that indicate that the decrease in physical activity begins around the age of 9 [36-38]. In this research, the results show that the level of physical activity decreases with the years of music school, which, in addition to the research, represents an additional risk for the development of postural deformities.

A systematic review conducted on the many available self-report questionnaires for assessing PA in children and adolescents identified three such questionnaires as potentially the most appropriate: the Youth Risk Behavior Survey (YRBS), the Adolescent Health Survey, and the Physical Activity Questionnaire (PAQ-C/ PAQ -A) [39]. The analysis of data from the Physical Activity Questionnaire (PAQ-C) revealed a statistically significant connection between years of music school and physical activity in the direction that students who have been in music school longer are less physically active on average ($R_o = -0.285$, $p < 0.05$). A statistically significant correlation was established between the results on the scoliometer and the students' physical activity - students who are less physically active on average have higher scores on the scoliometer and are at a greater risk of developing scoliosis. Music students are mostly involved in physical activities of light to moderate intensity, and less often in high intensity activities [40] as show this study also.

Conclusion

This study shows that in almost a third (33,8%) of the children in the Primary Music School, some deviation of posture was observed. Children are less physically active with age; they spend more time playing music and attending music school classes. The most significant postural deviation is scoliotic posture, which is associated with bilateral differences, lack of physical activity and values on the scoliometer. The research did not find a statistically significant correlation between improper posture and playing an instrument. We can conclude that children in the music school are at risk of developing postural deformities associated with a lower level of physical activity, but not with practicing music, playing musical instruments.

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