THE PREVALENCE OF POSTURAL DISORDERS AMONG EIGHTH GRADE ELEMENTARY SCHOOL STUDENTS

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SUMMARY

By determining the prevalence of postural disorders among eighth grade school students it is possible to indicate the state of these disorders at the end of the elementary school level of education, and compare it to the results obtained by applying corrective treatments on high school students. Thus, the aim of the research was to determine the prevalence of postural disorders among eighth grade school children. The research was carried out on a sample of 101 eighth grade students of both genders, aged 14. The photometry method was used to determine the presence of any postural disorders. The research results indicated that a proportionally statistically significant large number of participants with postural disorders were identified. Of the total number of participants, 60.4% had postural disorders, the most prevalent of which was flat back (22.8%), kypho-lordosis, (20.8%), lordosis (9.9%) and kyphosis (6.9%). Analyzed in terms of gender, the percentage of the girls with postural disorders is statistically significantly greater than that of the boys. Due to the large number of children with postural disorders, the recommendation is that the evaluation of the postural status of students should take place not only at the elementary school age, but also at the high school age. In addition, evaluation alone is insufficient, and exercise programs to correct postural disorders are required as well.

Key words: Kyphosis, lordosis, kypho-lordosis, puberty, difference, correction

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INTRODUCTION

Deviations from proper posture viewed on the sagittal or frontal plane represent postural disorders. The greatest number of postural disorders occurs during childhood and adolescence (Levangie, & Norkin, 2005). They can affect the spinal column, lower extremities, and the thorax (Milenković, 2007). Postural disorders can be divided into types of poor posture and deformities. Poor posture includes deviations in terms of position, mutual relations and shape of the spinal column, lower extremities and the pelvis, which are the consequences of the weakness and the improper function of the active parts of the locomotor apparatus, primarily the muscles (Živković, 2009). Contrary to that, deformities represent structural changes which affect the skeletal system (Protić-Gava, 2014).

Viewed on the sagittal plane, the most prevalent functional postural disorders of the spinal column include: kyphosis, lordosis, kypho-lordosis, and flat back (Kosinac, 2008; Stoliński, Tyrakowski, Kozinoga, & Kotwicki, 2018). Less prevalent postural disorders which also occur in the sagittal plane are the concave and rounded back (Živković, 2009). Numerous studies have indicated the existence of postural disorders among elementary school students (Protić – Gava, & Krneta, 2010; Đokić, Međedović, & Smiljanić, 2011; Kojić, 2014; Jorgic et al., 2015; Đorđević et al., 2016), while not as many studies have included samples of high school students (Bubanj et al., 2012; Jorgić et al., 2016). The problem is the lack of systematic and longitudinal diagnostics of monitoring children during puberty (Pelemiš, Ujsasi, Pelemiš, Mitrović, & Lalić, 2015), as well as children who are eighth graders.

The critical period for the emergence of postural disorders are the first few years of life, that is, the period when a child first begins to stand erect and stand on its own, then from the ages of 6 to 7, and puberty (Živković, 2009). During puberty, in addition to pronounced neuro-hormonal influence, increased growth ensues, due to which there may be some discrepancy between bone growth and muscle development, which could cause the emergence of postural disorders of the spinal column (Medojević & Jakšić, 2007). Since most eighth-grade students have reached puberty, it is possible that the number of children with postural disorder can increase. Furthermore, programs of corrective exercise are mostly aimed at elementary school students. However, if a significant prevalence of postural disorders among eighth grade students is noted, then exercise programs for the correction of postural disorders should be continued during high school as well. Considering the aforementioned aim of this research, it is important to determine the prevalence of postural disorders among eighth grade elementary school students.

THE RESEARCH METHOD

The sample of participants

The research was carried out on a sample of 101 eighth-grade school students aged 14, who attend three elementary schools on the territory of Knjaževac. In terms of gender, the research included 57 boys and 44 girls. Participation in the research was on a voluntary basis, but written consent was obtained from the parents.

The sample of measuring instruments

A diagnosis of the postural status of the participants on the sagittal plane required the use of the photometry method, and the implementation of a special device (Formetric 4D System, Diers, Germany) which had previously been used in other research (Đorđević, Vidojević, Đokić, Milenković, & Stanković, 2018). The validity and the reliability of this device has already been determined (Frerich, Hertzler, Knott, & Mardjetko, 2012; Lason, Peeters, Vandenberghe, Byttebier, & Comhaire, 2015). Based on the results obtained by implementing the method for determining postural status on the sagittal plane, the following variables were identified: ND – normal posture, KF - kyphosis, LD – lordosis and KL - kypho-lordotic posture and RL- flat back.

Statistical analysis

The results of the measurement for each of the variables are presented as numerical values and frequencies (%). To determine the differences in the prevalence of postural disorders and normal posture, the Chi square test was used to analyze the goodness of fit. To determine the differences in the prevalence of postural disorders in relation to the gender of the participants, the Chi square test of independence was used. The level of statistical significance was set at $p \leq 0.05$. The data were processed using the program IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY: IBM Corp.

RESEARCH RESULTS

The results in table 1. indicate the prevalence of postural disorders in the overall sample of participants, as well as in relation to gender. Of the overall number of participants, 60.4% have a postural disorder, the most prevalent of which are flat back and kypho-lordotic posture. In the sub-sample of boys, 50.9% have postural disorders, while in the sub-sample of girls, 72.7% do. In the subsample boys, the most prevalent disorder is flat back, and in the subsample of girls, kypho-lordosis.

Table 1. The prevalence of postural disorders in the overall sample and the subsamples of boys and girls

Variable	Participants		Boys		Girls	
	Frequency	%	Frequency	%	Frequency	%
ND	40	39,6	28	49,1	12	27,3
KF	7	6,9	7	12,3	0	0
LD	10	9,9	0	0	10	22,7
KL	21	20,8	5	8,8	16	36,4
RL	23	22,8	17	29,8	6	13,6
Total	101	100,0	57	100,0	44	100,0

Legend: ND – normal posture, KF - kyphosis, LD – lordosis and KL- kypho-lordotic posture and RL- flat back.

Tables 2., 3., and 4. provide the results of the χ2 test used to determine the differences in the frequency of the prevalence of postural disorders in the total sample of participants, and in the subsamples of girls and boys.

Table 2. The results of the χ2 test for the overall sample of participants

Variable	Frequency	(%)	χ2 test	
ND	40	39.6	Chi-Square	4,366
PP	61	60.4	df	1
Total	101	100	Asymp. Sig.	,037

Legend: ND - no postural disorders; PP - postural disorders

The results shown in table 2. indicate that there is a statistically significant greater frequency of postural disorders in the participants.

Table 3. The results of the χ2 test for the subsample of boys

Variable	Frequency	(%)	χ2 test	
ND	28	49,1	Chi-Square	,018
PP	29	50,9	df	1
Total	57	100	Asymp. Sig.	,895

Legend: ND - no postural disorders; PP - postural disorders

In the case of the subsample of boys (table 3.), there is no statistically significant difference in the frequency of occurrence of participants with and without postural disorders.

Table 4. The results of the χ2 test for the subsample of girls

Variable	Frequency	(%)	χ2 test	
ND	12	27.3	Chi-Square	9,091
PP	32	72.7	df	1
Total	44	100	Asymp. Sig.	,003

Legend: ND - no postural disorders; PP - postural disorders

For the subsample of girls (table 4.) the frequency of occurrence of girls with postural disorders is statistically significantly greater than that of girls without postural disorders.

The results shown in table 5. indicate that there is a connection between the prevalence of postural disorders and the gender of the participants. It could be noted that there is a statistically significant greater frequency of postural disorders in girls than in boys.

Table 5. Differences in the prevalence of postural disorders in relation to gender

gender * postural disorders Crosstabulation					
			postural disorders		Total
			ND	PP	
gender	male	Count	28	29	57
		% within gender	49,1%	50,9%	100,0%
		% within posture	70,0%	47,5%	56,4%
		% of Total	27,7%	28,7%	56,4%
	female	Count	12	32	44
		% within gender	27,3%	72,7%	100,0%
		% within posture	30,0%	52,5%	43,6%
		% of Total	11,9%	31,7%	43,6%
Total		Count	40	61	101
		% within gender	39,6%	60,4%	100,0%
		% within posture	100,0%	100,0%	100,0%
		% of Total	39,6%	60,4%	100,0%

χ2 test	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4,956	1	,026
Continuity Correction	4,085	1	**,043**
Likelihood Ratio	5,052	1	,025
N of Valid Cases	101		

Legend: ND - no postural disorders; PP - postural disorders

DISCUSSION

The research focused on the prevalence of postural disorders among eighth grade elementary school students. Table 1. shows the results of the prevalence of postural disorders in the sagittal plane among eighth grade elementary school students. Of the total sample of participants, 60.4% have a postural disorder in the sagittal plane. Based on the analysis of a larger number of studies (Batistão, Moreira, Coury, Salasar, & Sato, 2016) it was determined that postural disorders are prevalent in more than 50% of children. An analysis based on gender has indicated that 50.9% of boys and 72.7% of girls have some of a postural disorders. Of the postural disorders in the sagittal plane, the most prevalent include flat back (22.8%) and kypho-lordosis (20.8%). According to some authors (Živković, 2009) flat back is a postural disorder which is characterized by the absence of a physiological curve of the spinal column, due to which it is considered an actual deformity. However, according to others, flat back can be a postural disorder if a significant decrease in lumbar lordosis occurs (Booth, Bridwell, Lenke, Baldus, & Blanke, 1999). As a result of this disorder, general flexibility decreases, especially in the lumbar region (Živković, 2009). Therefore, flat back should be treated as a postural disorder and exercises should be applied which affect the formation of normal physiological curvatures of the spinal column. Kypho-lordosis has a prevalence of 20.8%, and can occur due to non-corrected increased lumbar lordosis, and an increase in the angle of thoracic kyphosis can occur as compensation (Ibrahim, & Akindele, 2018). It could indicate significant physical inactivity which results in the greater prevalence of kypho-lordosis compared to the individual disorders of kyphosis and lordosis. Analyzed in relation to gender, kypho-lordosis was more prevalent in the sub-sample of girls (36.4%).

By studying postural deformities such as kyphosis and lordosis, no signs of lordosis were detected among the subsample of boys, and there was no occurrence of kyphosis in the subsample of girls. The obtained data are in agreement with the results of more extensive studies (Poussa et al., 2005) which determined and monitored postural disorders among pubescent children. In the cited research, it was determined that pubescent boys constantly have a greater angle of kyphosis compared to pubescent girls from the ages of 11 to 14. On the other hand, a constantly greater angle of the lordotic curvature of the spinal column was noted among the girls. As confirmation of the mentioned relationship between the prevalence of postural disorders (Pokrywka, Fugiel, & Posłuszny, 2011), a greater prevalence of lordosis was also determined among the girls, and kyphosis among the boys, aged 7 to 11. This was also confirmed among older participants, that is, high school students (Mirbagheri, Rahmani-Rasa, Farmani, Amini, & Nikoo, 2015). According to (Lang-Tapia, España-Romero, Anelo, & Castillo, 2011) the greater angle of lordosis among girls could be a consequence of the variations in the shape of the spinal vertebrae.

The results shown in table 2. indicate a statistically significant difference in the proportion or frequency of participants with postural disorders and participants without postural disorders. We can see that 60.4% of the overall number of participants have a postural disorder. By analyzing the proportion of the prevalence of postural disorders in terms of gender, no statistically significant difference was determined for the subsample of boys (table 3.). The frequency of occurrence of boys with and without postural disorders is quite similar (50.9% vs 49.1%). In the case of the subsample of girls (table 4.) there is a statistically significant difference in the frequency of occurrence of girls with and without postural disorders (72.7% vs 27.3%). It is precisely the subsample of girls which contributes to the significantly greater number of participants with a postural disorder. This is confirmed by the results shown in table 5. The frequency of postural disorders in the subsample of girls is statistically significantly greater than that in the subsample of boys. The data obtained in this study indicate that in the analyzed group of eighth grade school students, a significant number of children, over 60.4%, have some form of postural disorder in the sagittal plane, which is especially pronounced in the subsample of girls with 72.7%. The reasons for such a great number of children with postural disorders can be insufficient physical activity, which represents a significant health risk for both adults and children (Sallis, 1993). It was also determined that the level of physical inactivity increases as children grow older, and is more prevalent among girls than boys (Trost et al., 2002). Since physical inactivity is one of the causes of acquired postural disorders (Protić-Gava, Zečak, & Shukova-Stojmanovska, 2014), it can be assumed that it had an impact on the greater prevalence of postural disorders among the studied group of students, especially the subsample of girls. Considering that puberty presents one of the critical periods for the development of postural disorders (Kosinac, 2006; Radaković et al., 2017) due to accelerated growth and can sometimes be accompanied by an unequal development of the elements of the locomotor apparatus, it can be assumed that it influenced the overall number of children with a postural disorder. Since the focus of this study was not to determine whether a correlation exists between the prevalence of postural disorders and puberty in the studied group, the drawn conclusions must be of a hypothetical nature, and should provide the basis for further research.

The determined frequency of over 60% of children with postural disorders who are eighth grade students indicates the need to monitor the postural status of children during high school as well, that is, until the end of the phase of growth and development, and not only during elementary school. It is also necessary for corrective programs for postural disorders to be carried out until the end of the same phase.

CONCLUSION

Based on the obtained results we can conclude that there is a statistically significant proportion of eighth grade school students with a postural disorder in the sagittal plane. The overall frequency of postural disorders in the students was 60.4%. Analyzed in terms of gender, the girls had a statistically greater prevalence of postural disorders than the boys. Due to the greater number of children with postural disorders, the recommendation is that the evaluation of the postural status of children be carried out not only at the elementary school age, but also during high school. Also, during this phase of development, carrying out exercise programs for the correction of postural disorders is just as important as monitoring them.

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ЗАСТУПЉЕНОСТ ПОСТУРАЛНИХ ПОРЕМЕЋАЈА КОД УЧЕНИКА ЗАВРШНОГ РАЗРЕДА ОСНОВНЕ ШКОЛЕ

САЖЕТАК

Утврђивање заступљености постуралних поремећаја код деце осмог разреда указује какво је стање ових поремећаја на крају основношколског узраста и у односу на добијене резултате потребу за применом корективног третмана у средњешколском узрасту. С обзиром на наведено циљ истраживања је био да се утврди заступљеност постуралних поремећаја код ученика 8 разреда. Истраживање је спроведено на узорку од 101 ученика 8 разреда оба пола просечне старости 14 година. Утврђивање постуралних поремећаја вршено је методом фотометрије. Резултати истраживању су показали да је пропорционално статстички значајно више испитаника са постуралним поремећајима. Од укупног броја њих 60.4% је имало постуралне поремећаје, при чему су најзаступљенији били равна леђа (22.8%), кифолордотично лоше држање, (20.8%), лордотично лоше држање (9.9%) и кифотично лоше држање тела (6.9%). Посмтрајући у односу на пол пропорција девојчица које имају постуралне поремећаје статистички је значајно већа у односу на дечаке. Због великог броја деце са постуралним поремећајима, препорука је да се процена постуралног статуса деце врши не само у основношколском већ и у средњешколском узрасту. Такође, потребно је у наведеном узрасту поред процене спроводити и програме вежбања за корекцију постуралних поремећаја.

Кључне речи: кифоза, лордоза, кифолордоза, пубертет, разлика, корекција

РАСПРОСТРАНЕННОСТЬ НАРУШЕНИЙ ОСАНКИ У УЧАЩИХСЯ ВОСЬМОГО КЛАССА НАЧАЛЬНОЙ ШКОЛЫ

АННОТАЦИЯ

Определяя распространенность нарушений осанки у учащихся восьмого класса, можно указать состояние этих нарушений на последнем этапе обучения в начальной школе и сравнить его с результатами, полученными при применении коррекционных методов лечения у старшеклассников. Таким образом, цель исследования – определение распространенности нарушений осанки у восьмиклассников. Исследование проводилось на выборке из 101 ученика восьмого класса обоего пола в возрасте 14 лет. Для определения наличия каких-либо нарушений осанки использовался метод фотометрии. Результаты исследования показали, что было выявлено пропорционально статистически значимое большое количество участников с нарушениями осанки. Среди участников 60,4% имели нарушения осанки, наиболее распространенными из которых были плоскостопие (22,8%), кифоз-лордоз (20,8%), лордоз (9,9%) и кифоз (6,9%). Анализируемый с точки зрения пола, статистически процент девочек с нарушениями осанки значительно больше, чем у мальчиков. В связи с большим количеством детей с нарушениями осанки рекомендуется проводить оценку осанки учащихся не только в начальной школе, но и в средней школе. Кроме того, недостаточно принимать во внимание только оценку, но также необходимо разработать программы упражнений для коррекции нарушений осанки.

Ключевые слова: кифоз, лордоз, кифо-лордоз, половое созревание, разница, коррекция.