BODY POSTURE BY GRADE IN CLASS TEACHING STUDENTS

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Abstract
Body posture is a movement habit that is formed and changed throughout the lifespan of a person and carries all the characteristics of the movement activity and mental state of the individual. The aim of this study is to determine the condition and structure of posture deviations of the head, shoulders, chest, shoulder blades, spine, abdomen, legs and feet, as well as to determine significant differences between pre-test and post-test measurements in the results of incorrect posture in class students according to their grade. The survey was conducted on a sample of 1105 students, of which 221 are first grade students, 214 are second grade students, 218 are third grade students, 237 are fourth grade students and 215 are fifth grade students, between 5 and 12 years old. The research program included students from 1st to 5th grade in eleven elementary schools in Sarajevo: "Kovačići", "Behaudin Selmanović", "Sokolje", "Dobroševići", "Safet-beg Bašagić", "Zahid Baručija" "Fatima Gunić", "Aleksa Šantić", "Avdo Smailović", "Mehmedalija Mak Dizdar" and"Hamdija Kreševljaković". The diagnosis of body posture was performed according to the criteria of Napoleon Wolanski, based on the determination of segmental dimensions in relation to each other, as follows: D1 - head posture (ODG), D2 - shoulder posture (ODR), D3 - breast posture (ODGR), D4 - shoulder blades posture (ODL), D5 – spine posture (ODK), D6 – abdomen posture (ODTR), D7 –legs posture (ODN), D8 – feet posture (ODS). After the analysis of body posture in the pre-test measurement, data were found that showed statistically significant differences between the students of different grades in the presence and degree of deformity of the breast, shoulder blades, spine and abdomen at a level lower than 1% and in the deformities of the legs at a level lower than 5%, while there were no differences in deformities in other parts of the body, as well as in the assessment of the whole body posture. In the post-test measurement were also determined statistically significant differences between the students of different grades in the degree and representation of head deformities on a level lower than 5%, and on a level lower that 1% for head and legs deformities, while there were no differences in the deformities of other parts of the body, as well as in the assessment od the whole body posture.

Key words: *body posture, assessment, class teaching, class, physical education, corrective excercise.*

Introduction

Paušić (2005) conducted a longitudinal study lasting two years on a sample of 7-year-old children who started the first grade of elementary school, and followed the children through three time points. The main goal of the study was to determine the state of anthropometric characteristics and parameters for assessing the body posture in children starting the first grade of elementary school, and the state of changes in the same parameters in the period before starting the third grade of elementary school. A sample of 224 children and two sets of variables were taken for the purpose of achieving this goal. The first set consisted of 17 anthropometric variables, the second of 14 body posture assessment variables. All the obtained results indicated that there was an association of new school loads with an inadequately prepared child's organism between the ages of seven and eight. Between the ages of eight and nine, adaptation of the movement system to already known school loads was observed to a lesser extent. It was found that 51.58% of children in the first grade of elementary school had asymmetries of body posture indicators. For the same children, in one year, this percentage increased to 62.1%. In the first grade, it was found that 28.4% of children have chest irregularities, and after a year there was an increase to 51.6%. Lowered foot in children is present in 47.3% in the first grade, and in 60.7% of children in the second grade. From the data presented, it can be assumed that disorders of body posture of school children occupy an increasing share in health status, which is very devastating given the age of the children themselves. Krsmanović (2007) states that 53% of respondents have impaired body posture, while some authors point out that even more than 70% of school children have some physical disorders and certain difficulties that result from lack of movement.

Automatization and computerization in all spheres of life leads to hypokinesia, which is one of the primary preconditions for the development of improper body posture. In addition, bad habits, improper posture, improper sitting, inadequacy of school desks, school chairs, as well as excessive weight of school bags affect the appearance of various forms and an increasing number of postural disorders. In the period of growth and development, ie. between the ages of 6 and 18,

children are exposed to a variety of health problems including the problem of proper body posture (Bogdanović and Milenković, 2008).

Poor posture and deformities increase when children start school. Due to school obligations, physical activity decreases, because children spend most of their time in incorrect sitting position, improper standing, to which should be added the time spent at home: watching TV, using computers, video games, solving homework, inadequate bed and a pillow for sleeping, obesity, then tight, uncomfortable and heavy footwear, heavy clothing that pushes down the shoulders, and carrying a heavy school bag. Physical deformities that occur in childhood and are not corrected in time remain as a permanent handicap and significantly affect the entire life of the child. In these cases, the tired body of the children looks for a position where they can get as much rest for as short a time as possible. This position eliminates fatigue, but at the same time affects the irregular postular status (Beganović and Bešović, 2011). Proper body posture should be at the very top, as it is a basic prerequisite for good health, normal growth and development and good looks of every student. It is a movement habit that is formed and changed throughout a person's lifespan.

Teachers should recognize improper posture, so that they can adequately suppress it. It has been determined that pain in the lumbar spine in school children occurs from 20% to 51% of the total school population of children. Also, back pain is associated with prolonged sitting, weakness in certain muscle groups, poor posture etc. Based on the research, a high percentage of irregular body posture in school children was determined, as well as the occurrence of postural disorders on the spinal column (scoliosis and kyphosis) and deviations on the longitudinal arch of the foot (Beganović and Bešović, 2012). Proper posture creates favorable conditions for the moving apparatus. Students with symmetrical shoulders, straight shoulder blades and straight spinal line have good posture, and students with irregular shoulder positions, uneven shoulder blades, head and shoulders bent forward, increased hunching over, recessed chest, prominent shoulder blades, flabby and bulging belly, slightly bent knees and moved forward, have an incorrect posture (Beganović, Bešović and Bešović, 2012).

Maintaining a normal upright position is possible only if the locomotor system is in good condition, properly and proportionally developed, without mechanical damage. Disproportions in the growth and development of the joint-bone and muscular system are particularly expressed during adolescence, especially at its most intense stage, puberty. It is during this period that the organism is very sensitive and subject to numerous negative influences. By reducing physical activity, the resistance of the locomotor system to the effect of external factors also decreases. Increased sensitivity of the organism during adolescence enables the appearance and development of numerous postural disorders. Therefore, as well as due to fatigue that occurs due to long sitting, children very often take irregular positions that later turn into bad habits, and over time into physical disorders, whether milder, or more serious.In addition, the way children get to and from school has changed in recent years, mostly thanks to the growing number of cars. Unlike previous generations of students who went to school, training, visiting relatives, etc. mostly on foot, often for miles, children in the twenty-first century walk very little. Transportation from one place to another takes place exclusively by cars, buses, vans, etc. Such a lifestyle, in addition to a number of comforts, has certain consequences, which adversely affect motor abilities, postural status, and thus the aesthetic appearance and quality of life of a young person (Jovović and Čanjak, 2012).

Posture is a basic prerequisite for good health, normal growth and development of humans, which is why it is very important that care for proper posture begins in preschools. Modern science in this field deals with the study of the function of the locomotor system. The locomotor system implies the ratio of active and passive forces of the human body. Active forces include muscles and passive forces include bones, joints and ligaments. By disrupting the relationship between active and passive forces in the body, postural changes and organic damage can occur. Reduced physical activity in children before the school starts causes not only reduced functional and biomotor abilities, but also contributes to the appearance of poor posture and, as a consequence, the occurrence of body deformity. Physical deformity permanently characterizes the child, both in physical appearance and in a special mental state. Therefore, it is necessary to detect the deformity in the initial stage and do everything to prevent its further development (Nikšić, Mahmutović and Rašidagić, 2015a). Body posture refers to the habitual position of the body that a person takes standing, sitting, walking and in other activities. Proper posture creates favorable conditions for the moving apparatus. The status of children is becoming more and more current, given today's fast-paced lifestyle, so teachers need to know how to recognize improper posture, so that they can adequately suppress it.

Due to its versatile importance, body posture is emphasized in Physical and health education of all ages, as a starting point and as a basic element of movement culture, because poor posture is essentially an initial stage of a certain deformity, such as: spinal deformities (scoliosis , lordosis, kyphosis), chest deformities (bulging breasts, recessed breasts, straight breasts), hip deformities (poor development, half-dislocation, dislocation), lower extremity deformities ("O" legs, "X" legs, saber legs), feet deformities (straight, raised) (Nikšić, Mahmutović and Rašidagić, 2015b). The aim of this research is to determine the condition and structure of the deviations of posture of the head, shoulders, breasts, shoulder blades, spine, abdomen, legs and feet, as well as to determine

significant differences between the pre-test and post-test measurements in the results of improper posture in the class teaching students according to the grade they attend.

Methods

Sample of respondents
The analysis is conducted on a sample of N=1105 elementary school students from 11 elementary schools in Sarajevo Canton and the surrounding, with the average age of M=8,2864.

Table 1. Sample structure according to the grade the students attend.

Grade	Frequency	Percent
I	221	20,0
II	214	19,4
III	218	19,7
IV	237	21,4
V	215	19,5
Total	1105	100,0

The research included equally large subgroups according to the grade that students attend. All parents were informed about the implementation of the research, and were explained the purpose and goal of the research. Therefore, the research was supported by all parents, who gave their written consent.

Variable sample
The following measuring instruments / tests were applied:
- Description of body posture ratings (ODT).
Wolanski's criteria were applied to assess the interrelationships of 8 body segments by visual projection of marked points. Deviations are classified according to their magnitude and are evaluated by so-called negative points, whereby:

0 points -indicates no deviations,
1 point -indicates a slight deviation,
2 points -indicates and extreme deviation.

1. Head posture rating - ODG(0 - The perpendicular lowered from the base of the nasal bone should fall to the upper half of the sternum; 1 - The same perpendicular falls on the lower half of the sternum; 2 - The same perpendicular falls in front of the sternum).
2. Shoulder posture rating - ODR(0 –The central point of the shoulder joint (top of acromion) by projection on the neck falls into the back half of the neck silhouette;1 - The same point "falls" into the front silhouette of the neck;2 - The same point "falls" in the silhouette of Adam's apple).
3. Chest posture rating – ODGR (0 - The chest is harmoniously bell-shaped; 1 –The chest is flat; 2 - Deformity - "Chicken" breasts).
4. Shoulder blades posture rating – ODL (0 - The shoulder blades rest on the chest with the entire surface; 1 - "Winged" blades, ie. the blades are pulled apart for one finger of the subject; 2 - The blades are separated by two fingers of the subject).
5. Spine posture rating - ODK (0 - Physiological curvature normal in both sagittal and frontal planes; 1 –First degree deviation: kyphosis, scoliosis, or lordosis; 2 - A combination of deviations or individually, but on a second level degree).
6. Abdomen posture rating – ODTR (0 - Abdomen tucked behind the vertical, lowered behind the processus xiphoideus in the sagittal plane; 1 - Belly bulging in front of the lowered vertical; 2 - ”Hanging” belly (pear-shaped) and flaccid muscles).
7. Legs posture rating - ODN (0 - Posture normal: knees vertically straight or at least approximately; 1 - Posture normal: knees tending towards the "X" shape and connecting; 2 - Standing posture: significant tendency of the knee towards “X” or significant tendency towards “0” shape for a thickness more than 2 fingers of the subjects).
8. Feet posture rating – ODS (0 –Tread surface of the foot only on 1/3 of the transverse line. It is evaluated by measuring the footprint; 1 –Tread surface of the foot covered the other third as well; 2 - Tread surface of the foot covered the complete transverse line).

Note 8: The statusassessment of the arch of the foot was calculated by the Thomson method. The Thomson foot index (%) was obtained by joining the most protruding parts of the heel and the metatarsus on the inside of the foot (line A-B) on the plantogram. Then the middle of the heel is found and a line (Mayer's line) is drawn from the middle of the heel to the outer edge of the third toe. From the Mayer line to the narrowest part of the longitudinal vault, on the plantogram, draw a normal and measure its value (“a”). From the vertex of the normal (“a”) draw the second normal towards the line AB and measure its value (“b”). Foot drop index will be obtained when these two values are set in the ratio: I = (a / b) x 100 =% - obtained percentage of foot drop of each foot of each individual, based on which points are given: 0 points up to 30% , 1 point from 30 to 60%, 2 points over 60%. Determining the general assessment of posture was done according to the criteria of Napoleon Wolanski (1975): excellent (0 points), very good (1 - 4 points), good (5 - 8 points), poor (9 - 12 points), very poor (13 - 16 points). The relation is 0 points (minimum) to 16 points (maximum). Assessment of the status of the arches of the feet was realized by the method of plantography. The index of lowering of the arches of the feet was determined using the Thomsen method. I = (a/b) x 100 =% - obtained percentage of the lowering of the feet of each foot of each individual, on the basis of which points are given: 0 points up to 30%, 1 point from 30 to 60%, 2 points over 60 %.

Work program
The work program that was realized in this research lasted one school year. At the beginning of the school year in September, the pre-test (initial) measurement posture was performed according to the criteria of Napoleon Wolanski (1975), as

follows: D1 - head posture (ODG), D2 - shoulder posture (ODR), D3 - chest posture (ODGR) , D4 - shoulder blades posture (ODL), D5 - spine posture (ODK), D6 – abdomen posture (ODTR), D7 – legs posture (ODN), D8 - feet posture (ODS), with the help of a professor of physical education and health. The respondents practiced according to the program of elementary games intended for the prevention and correction of incorrect posture, which were made after the pre-test measurement.

The concept of the elementary games program was made so that it was implemented through the forms of applied activities in the physical and health culture of students in the classroom. Each exercise started with the preparation of the organism, both physiological and emotional. The cardiovascular introduction of the load functions yet to follow represented the initial physiological load.

The emotional introduction to this type of special program was extremely important. Each exercise was performed from easier to harder. In order to get the best possible effect, special attention was paid to the following: a concrete demonstration of exercises (elementary games), because these were strictly defined movements. So after the demonstration and the teacher's explanation, the students tried to do a certain task.

The explanations were short and related to the way of performing and the goal of individual games with respect to age. The content of the program was not static, because elementary games were applied in order to correct and prevent the present disorders, they changed and adapted to given situations, supplemented, depending on the motivation of students, because individual games, if repeated daily, become monotonous over time and this reduces the attention to proper movement. After the pre-test (initial) measurement, a 6-month (31-week) program was implemented. The program was implemented in the following months: October, November, December, February, March, April, which was done by teachers/classroom professors. Number of training units: physical education and health classes twice a week, where elementary games were applied in the function of prevention and correction of incorrect posture. The duration of one lesson was 45 minutes. At the end of the school year in May, the post-test (final) measurement posture was performed according to the criteria of Napoleon Wolanski (1975), as follows: D1 - head posture (ODG), D2 - shoulder posture (ODR), D3 - chest posture (ODGR) , D4 - shoulder blades posture (ODL), D5 – spine posture (ODK), D6 - abdomen posture (ODTR), D7 – legs posture (ODN), D8 – feet posture (ODS), with the help of a professor of physical education. The 6-month program did not include testing and measurements, and they were performed before and after the application of the program. After the pre-test and post-test measurement, an evaluation of the obtained results was made.

Data processing methods

Descriptive statistics were used for statistical data processing. Frequencies and percentages were calculated. The non - parametric method Hi - square test was used to determine whether there is a statistically significant difference between students of different grades in the assessments of posture of certain body parts pre-test and post-test and made concrete conclusions at the level of statistical significance at less than 1% and 5%. The data obtained in this study were processed using SPSS 20.0 software packages.

Results and discussion

This chapter presents the frequency distributions of individual assessments of posture of body parts in the pre-test and post-test measurement in students of class teaching according to the grade.

Table 2. Values and levels of significance of Chi-squares in examining the differences between students of different grades in the assessments of posture of individual body parts pre-test and post-test

Body part	Pre-test			Post-test		
	Chi-square	Freedom degree	Level of significance p	Chi-square	Freedom degree	Level of significance p
Head	8,700	8	0,368	9.756	4	0.045 *
Shoulders	8,908	8	0,350	13,628	4	0,009 **
Chest	23,979	8	0,002 **	31,081	8	0,000 **
Shoulder blades	20,845	8	0,008 **	2,690	4	0,611
Spine	21,096	8	0,007 **	1,162	4	0,884
Abdomen	64,610	8	0,000 **	6,317	4	0,177
Legs	16,168	8	0,040 *	24,216	8	0,002 **
Feet	13,658	8	0,091	10,036	8	0,263
Complete body	14,930	16	0,530	9,256	8	0,321

* Chi-sqaure is statistically significant on a level lower than 5%
** Chi-sqaure is statistically significant on a level lower than1%

Table 2 shows that in the pre-test measurement there are significant differences between students of different grades in the prevalence and degree of deformity of the chest, shoulder blades, spine, abdomen, legs, while there are no differences in deformities in other parts of the body. The post-test measurement also found significant differences between students of different grades in the degree and prevalence of deformities of the head, shoulders, chest, legs, while there are no

differences in deformities in other parts of the body, as well as in the assessment of whole body posture. (Chi-squares are statistically significant).

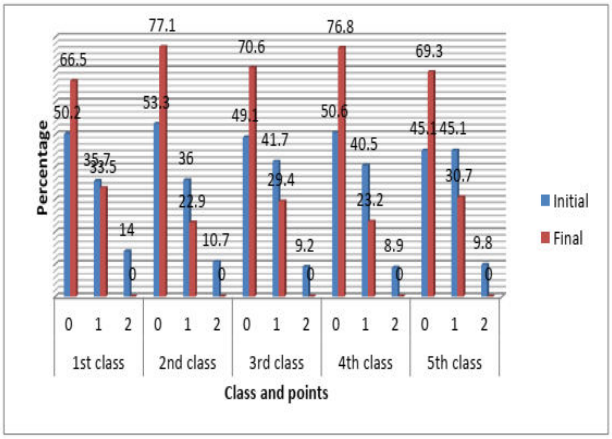

Figure 1. Presentation of the frequency distribution of individual head posture ratings in the pre-test and post-test measurement, and by class.

Figure 1 shows that in the pre-test measurement the largest number of students who do not have deviations in head posture were students from fourth grade, while the largest representation of a slight deviation in head posture had the fifth grade students, and a significant deviation had the first grade students in the pre-test measurement and this difference was not statistically significant as indicated by the Chi-square from the previous analysis (Chi-square = 8,700 ip = 0.368). And in the post-test measurement, and as can be seen from Figure 1, the largest number of students who did not have deviations in head posture were fourth grade students, and the largest representation of slight deviation had the first grade students, while a significant deviation of head posture was not present in any students and this time the difference was statistically significant at a level of less than 5% (Chi-square = 9.756 and p = 0.045).

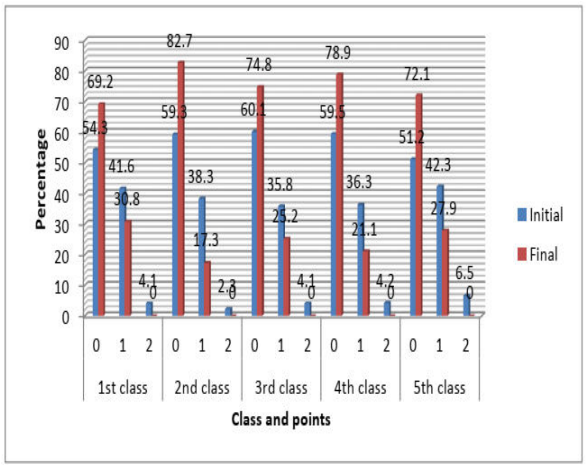

Figure 2. Presentation of the frequency distribution of individual shoulder posture ratings in the pre-test and post-test measurement, and by class.

Figure 2 shows that in the pre-test measurement the largest number of students who do not have deviations in shoulder posture were students from fourth grade, while the largest representation of slight deviation had first grade students, and a significant deviation in shoulder posture had fifth grade students in the pre-test measurement and this difference was not statistical significant as indicated by the Chi-square from the previous analysis (Chi-square = 8,908 ip = 0,350).

In the post-test measurement, and as can be seen from Figure 2, the largest number of students who did not have deviations in shoulder posture was from fourth grade, and the largest representation of slight deviation had the first grade students, while a pronounced deviation of shoulder posture was not present in any students and this time the difference was statistically significant at a level of less than 1% (Chi-square = 13,628 ip = 0.009).

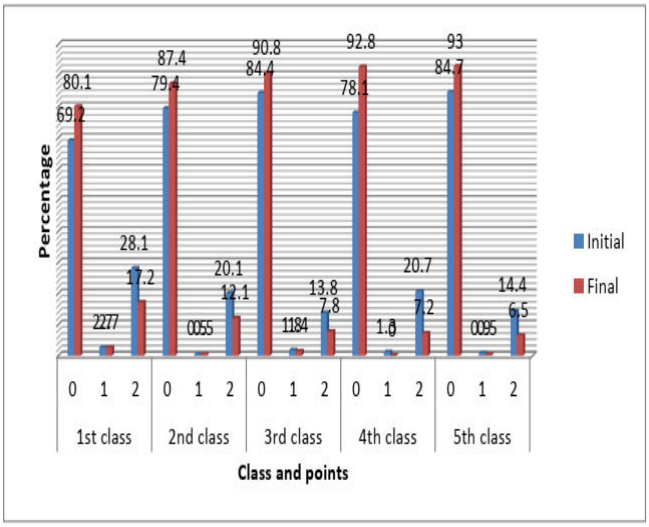

Figure 3. Presentation of the distribution of frequencies of individual ratings of chest posture in the pre-test and post-test measurement, and by class

Figure 3 shows that in the pre-test measurement the largest number of students who did not have deviations in chest posture were students from fourth grade, while the largest representation of slight and pronounced deviation in chest posture had first grade students in the pre-test measurement and this difference is statistically significant at a level lower than 1 %, as indicated by the Chi-square from the previous analysis (Chi-square = 23.979 and p = 0.002).

In the post-test measurement, and as can be seen from the above table and figure, the largest number of students who did not have deviations in chest posture were fourth grade students, and the largest representation of slight and pronounced deviation in chest posture had first grade students and this time the difference was statistically significant on a level lower than 1% (Chi-square = 31,081 ip = 0,000).

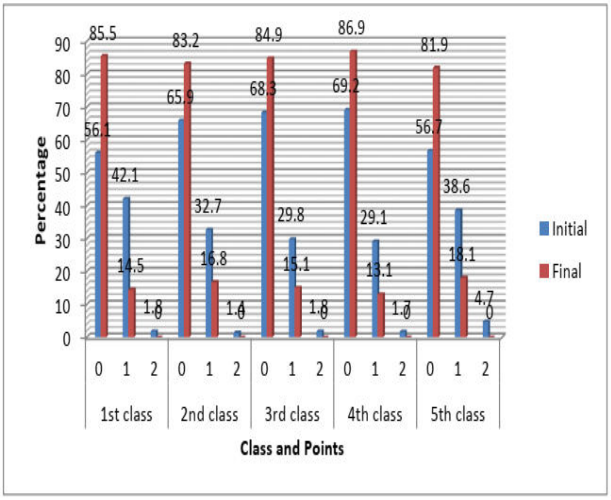

Figure 4. Presentation of the distribution of frequencies of individual ratings of shoulder blades posture in the pre-test and post-test measurement, and by class.

Figure 4 shows that in the pre-test measurement the largest number of students who did not have deviations in shoulder blades posture were fourth grade students, while the largest representation of a slight deviation had first grade students, and a significant deviation in shoulder blades posture had fifth grade students in the pre-test measurement and this difference is statistical significant at a level lower than 1%, as indicated by the Chi-square from the previous analysis (Chi-square = 20.845 ip = 0.008). And in the post-test measurement, and as can be seen from Figure 4, the largest number of students who did not have deviations in shoulder blades posture were fourth grade students, and the largest representation of a slight deviation had fifth grade student, while a significant deviation of shoulder blades posture was not present in any students and this time the difference was not statistically significant (Chi-square = 2,690 ip = 0,611).

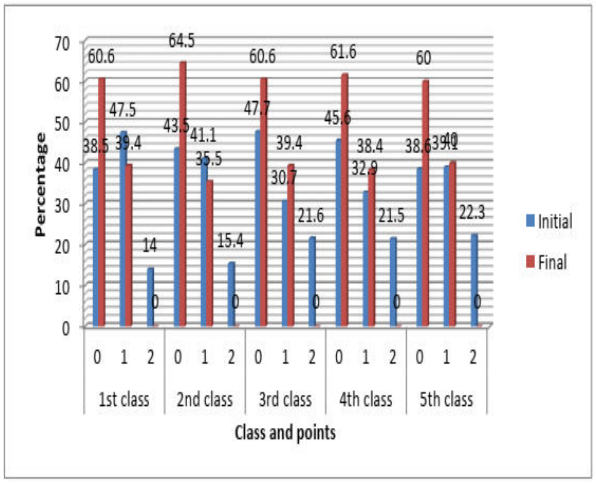

Figure 5. Presentation of the distribution of frequencies of individual ratings of spinal posture in the pre-test and post-test measurement, and by class.

Graph 5 shows that in the pre-test measurement the largest number of students who did not have deviations in spinal posture were fourth grade students, while the largest representation of slight deviation had first grade students, and a significant deviation in spinal posture hadfourth grade students in the pre-test measurement and this difference is statistical significant at a level lower than 1%, as indicated by the Chi-square from the previous analysis (Chi-square = 21.096 and p = 0.007). And in the post-test measurement, and as can be seen from Figure 5, the largest number of students who do not have deviations in spinal posture were fourth grade students, and the largest representation of slight deviation have the same fourth grade students, while a significant deviation of spinal posture is not present in any students and this time the difference was not statistically significant (Chi-square = 1.162 and p = 0.884).

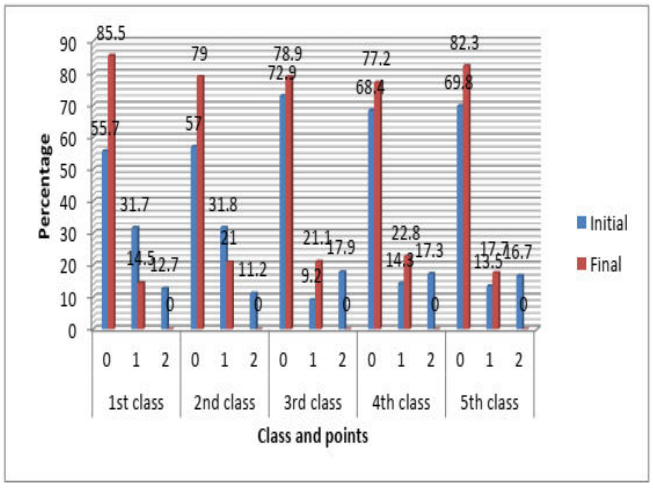

Figure 6. Presentation of the distribution of frequencies of individual ratings of abdominal posture in the pre-test and post-test measurement, and by class.

Figure 6 shows that in the pre-test measurement the largest number of students who do not have deviations in posture were fourth grade students, while the largest representation of a slight deviation had first grade students, and a significant deviation in abdominal posture had fifth grade students in the pre-test measurement and this difference is statistical significant at a level lower than 1%, as indicated by the Chi-square from the previous analysis (Chi-square = 64,610 ip = 0,000).

In the post-test measurement, and as can be seen from Figure 6, the largest number of students who do not have deviations in abdominal posture were first grade students, and the largest representation of slight deviation had fourth grade students, while a pronounced deviation of abdominal posture was not present in any students and this time the difference was not statistically significant (Chi-square = 6.317 ip = 0.177).

Figure 7 shows that in the pre-test measurement the largest number of students who did not have deviations in legs posture were fourth grade

students, while the largest representation of slight and pronounced deviation in legs posture had first grade students, in the pre-test measurement and this difference is statistically significant at a level lower than 5%, as indicated by the Chi-square from the previous analysis (Chi-square = 16,168 and p = 0.040). And in the post-test measurement, and as can be seen from Figure 7, the largest number of students who did not have deviations in leg posture were fourth grade students, and the largest representation of slight and pronounced deviation of leg posture had first grade students and this time the difference was statistically significant at a level lower than 1 %, (Chi-square = 24.216 ip = 0.002).

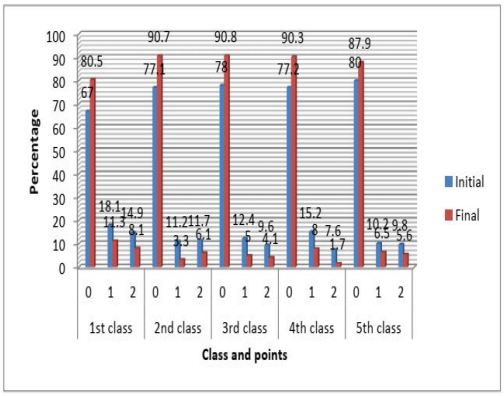

Figure 7. Presentation of the distribution of frequencies of individual ratings of legs posture in the pre-test and post-test measurement, and by class.

Figure 8 shows that in the pre-test measurement the largest number of students who did not have deviations in feet posture were fourth grade students, while the largest representation of a slight deviation in feet posture hadfourth grade students, and the largest representation of significant deviation in feet posture had first grade students in the pre-test measurement and this difference was not statistically significant, as indicated by the Chi-square from the previous analysis (Chi-square = 13.658 and p = 0.091).

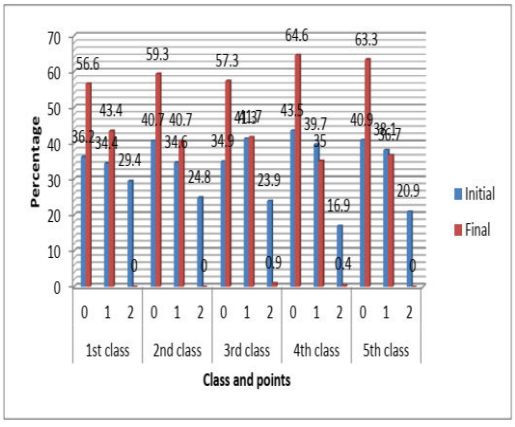

Figure 8**.** Presentation of the distribution of frequencies of individual ratings of feet posture in the pre-test and post-test measurement, and by class.

In the post-test measurement, and as can be seen from Figure 8, the largest number of students who did not have deviations in feet posture were fourth grade students, while the largest representation of slight deviation in feet posture had first grade students, and the largest representation of marked deviation in feet posture had third grade students and this time the difference was not statistically significant (Chi-square = 10,036 and p = 0.263).

Table 3 shows that in the pre-test measurement there were no statistically significant differences between students attending different grades in the overall assessment of the whole body posture. In the post-test measurement, also no significant differences were found between students attending different grades in the overall assessment of the whole body posture (Chi-square is not statistically significant).

Table 4 shows that in the post-test measurement, all students attending different grades have less bad ratings, and higher (better) assessments of whole body posture were represented compared to the pre-test measurement. In the pre-test measurement, all students attending different grades had the highest ratings 3 and 4, and in the post-test measurement ratings were 4 and 5. Rating 1 was not present in any way in students of II, IV and V grades in either the pre-test or post-test measurement, and in students of I and III grade in the post-test measurement, and rating 2 was not represented in the post-test measurement in all students attending different grades. Rating 5 was most prevalent among fourth-grade students, and least among first-grade students, while rating 4 was most prevalent among first- and fourth-grade students, and least among second-grade students. The relation was 0 points (minimum) to 16 points (maximum).

Numerous authors have conducted similar research. The results of the study of body posture measurements, which were obtained on a sample of 60 respondents, of fifth grade, aged 10-11 years, showed that 57% of students have proper body posture, while 43% of students have improper body posture. By measuring the lateral curvature of the spine, it was found that 57% of students have good posture, 13% of students have irregular shoulder position, different levels of the shoulder blades, which is called scoliosis, and 30% of students have their head bent forward, shoulders bent forward, intensly henched forward, chest retracted, shoulder blades prominent, abdomen flaccidly convexed, knees slightly bent and moved forward, indicating a deformity called kyphosis. Checking the structure of the feet resulted in the following 33 results: 42% of students have good feet, 35% of students have flat feet and 23% of students have raised feet. Based on the obtained results, it can be concluded that there is a high percentage of improper posture in children of younger school age, as well as the percentage of postural disorders of the spine (scoliosis and kyphosis) and deviations in the longitudinal arch of the foot (Beganović and Bešović, 2012).

By measuring body posture according to the criteria of Napoleon Wolanski, on a sample of 60 respondents of sixth grade, aged 11-12 years, the authors concluded that 20 students or 34% had no deviation, 17 students or 28% had a slight deviation and 23 students or 38% hadextreme deviation. When assessing shoulder posture, 21 student or 35% had no deviation, 32 students or 53% had a slight deviation and 7 students or 12% hadextreme deviation. In the assessment of chestposture, 27 students or 45% had no deviation, 30 students or 50% had a slight deviation and 3 students or 5% hadextremedeviation. In the assessment of shoulder blades posture, 27 students or 45% had no deviation, 23 students or 38% had a slight deviation and 10 students or 17% had extreme deviation. In the assessment of spinal posture, 26 students or 43% had no deviation, 22 students or 37% had a slight deviation and 12 students or 20% hadextreme deviation. In the assessment of abdominal posture, 28 students or 46% had no deviation, 25 students or 42% had a slight deviation and 7 students or 12% had extreme deviation. In the assessment of leg posture, 31 students or 52% had no deviation, 25 students or 42% had a slight deviation and 4 students or 6% had extreme deviation. In the assessment of feet posture, 18 students or 30% had no deviation, 38 students or 63% had a slight deviation and 4 students or 7% hadextreme deviation (Beganović et al., 2012).

Table 3. Values and significance levels of Chi-square in examining differences between students attending different grades in the general assessment of posture of the whole body pre-test and post-test.

Pre-test			Post-test		
Chi-square	Freedom degree	Level of significance p	Chi-square	Freedom degree	Level of significance p
14,930	16	0,530	9,256	8	0,321

Table 4. Presentation of the distribution of frequencies of individual ratings of full body posture in the pre-test and post-test measurement, and by class.

Grade	Full body posture measuring				
	Rating	Pre-test		Post-test	
		F	%	F	%
I	1 (13-16)	1	0,5	0	0,00
	2 (9-12)	17	7,7	0	0,00
	3 (5-8)	100	45,2	24	10,9
	4 (1-4)	85	38,5	154	69,7
	5 (0)	18	8,1	43	19,5
	Total	221	100,0	221	100,0
II	1 (13-16)	0	0,00	0	0,00
	2 (9-12)	9	4,2	0	0,00
	3 (5-8)	88	41,1	20	9,3
	4 (1-4)	92	43,0	132	61,7
	5 (0)	25	11,7	62	29,0
	Total	214	100,0	214	100,0
III	1 (13-16)	1	0,5	0	0,00
	2 (9-12)	11	5,0	0	0,00
	3 (5-8)	80	36,7	20	9,2
	4 (1-4)	103	47,2	144	66,1
	5 (0)	23	10,6	54	24,8
	Total	218	100,0	218	100,0
IV	1 (13-16)	0	0,00	0	0,00
	2 (9-12)	10	4,2	0	0,00
	3 (5-8)	90	38,0	15	6,3
	4 (1-4)	110	46,4	154	65,0
	5 (0)	27	11,4	68	28,7
	Total	237	100,0	237	100,0
V	1 (13-16)	0	0,00	0	0,00
	2 (9-12)	17	7,9	0	0,00
	3 (5-8)	82	38,1	19	8,8
	4 (1-4)	93	43,3	144	67,0
	5 (0)	23	10,7	52	24,2
	Total	215	100,0	215	100,0

The results (Jovović and Čanjak, 2012) showed that postural status is very neglected in a large number of respondents. It was determined that the largest number of respondents have impaired status of the spine and shoulder blades. Disorders of the lower extremities of "O" legs and flat foot also showed a high frequency. The presence of other deviations is smaller, with hollowed and bulging chest being the least common disorders in the examined cases, especially in girls. It has been shown that by far the largest percentage of deviations are functional disorders, which can be successfully corrected by adequate application of physical treatment, which coincided with the results of some previous research. It is interesting to note that winged shoulder blades, scoliosis and kyphosis showed a significantly higher frequency in male subjects. Insufficient capacity of muscular strength leads to faster fatigue, and disorders on the spinal column and shoulder blades most often occur, which is the result of insufficiency of the ligament-muscular apparatus in conditions of accelerated growth. The results of the research showed that lordosis is more prevalent in girls, which is supposed to be related to the body posture characteristic for a large number of females. Postural disorders of the lower extremities, especially the "O" leg and flat foot, were present in a large number of subjects of both sexes.

The frequency of other physical disorders is somewhat lower. Concave and bulging chest were shown to be the least common physical disorders in subjects of both sexes. Based on a more detailed analysis, it can be noticed that the frequency, structure and level of prevalence of postural disorders were significantly different between boys and girls, in this age group.

The results of measuring body posture according to the criteria of Napoleon Wolanski, conducted on a sample of 235 respondents, aged 11 to 15 years, showed that there were statistically significant differences in the analysis of individual body segments (shoulders, chest, shoulder blades) between boys and girls aged 11 to 15 years. Significant differences between boys and girls did not exist in posture of the head, deviation of the spine in the frontal plane, posture of the abdomen, shape of the legs, arch of the feet (Terzija, 2015). By measurement analysis of body posture according to the criteria of Napoleon Wolanski, on a sample of 1105 respondents, aged 5 to 12 years, the authors concluded that in the post-test measurement there was a change in the value of deformity degree of individual body parts compared to the pre-test measurement. in the teaching of physical education and health had a great importance in creating habits for a healthy and hygienic life and preventing improper posture.

Any elementary game activates the complete locomotor system crucial for the transformation of energy that is essential for the activity of all cells in the body, and games and physical activity can be treated as a determinant for the harmonious development of all child's characteristics. Each of Wilcoxon's Z-expressions is statistically significant at a level well below 1%, and it can be concluded that for each part of the body there was a significant decrease in the value of the degree of deformity in the post-test measurement compared to the pre-test measurement (Nikšić et al., 2015b). Based on the results of research on body posture measurements in urban and rural students, the authors concluded that in the pre-test measurement there were statistically significant differences between men and women from urban and rural schools in the prevalence and degree of deformity of the head, shoulders, shoulder blades, spine, abdomen. legs, feet, as well as in the assessment of posture of the whole body, while there were no differences in the assessments of the chest posture. The post-test measurement also found significant differences between men and women from urban and rural schools in the degree and prevalence of deformities of the head, shoulders, chest, shoulder blades, spine, abdomen, legs, feet, as well as in the assessment of whole body posture - Chi-squares were statistical significant (Nikšić et al., 2015a). Based on the obtained research results in examining the differences in the prevalence of deformities of individual body parts in the pre-test and post-test measurement, on a sample of 1105 subjects aged 5 to 12 years, we can conclude that at the descriptive level there were statistically significant differences in the prevalence of certain types of deformities. Deformities of the feet and spine were the most common, and the least common were deformities of the chest in both the pre-test and post-test measurements (Nikšić et al., 2019).

Conclusion

The aim of this study was to determine the condition and structure of deviations in posture of the head, shoulders, chest, shoulder blades, spine, abdomen, legs and feet, as well as to determine significant differences between pre-test and post-test measurements in the results of improper posture in students according to the grade they attend. The research was conducted on a sample of 1105 students, of which 221 were first grade students, 214 second grade students, 218 third grade students, 237 fourth grade students and 215 were fifth grade students, aged 5-12 years. Based on the obtained research results, it can be concluded that there are certain deviations from the normal postural status in certain body segments, which lead to poor posture and physical deformities in students of all grades. Improper posture is present to a large extent, and this can be explained by a lack of sports, the negative impact of the environment and improper diet. After the pre-test measurement, data were obtained which showed that there were statistically significant differences between students of different grades in the prevalence and degree of deformity of the chest, shoulders, spine and abdomen at a level below 1%, and in deformities of the legs at a level below 5%, while there were no differences in deformities in other parts of the body, as well as in the assessment of posture of the whole body.

The post-test measurement also found statistically significant differences between students of different grades in the degree and prevalence of head deformities at a level below 5%, and in deformities of the shoulders, chest, legs again at a level below 1%, while there were no differences in deformities in other parts of the body, as well as in the assessment of the whole body posture. Based on the tables at the descriptive level, it can be concluded that in the post-test measurement, all students attending different grades had fewer badratings, and were more represented the higher (better) assessments of the whole body posture compared to the pre-test measurement. In the pre-test measurement, all students attending different grades have the highest ratings 3 and 4, and in the post-test measurement ratings 4 and 5. Rating 1 was not present in any way in students of second, fourth and fifth grades in either the pre-test or post-test measurement, and in students of first and third grade in the post-test measurement, and rating 2 was not represented in the post-test measurement in all students attending different grades. Rating 5 was most prevalent among fourth-grade students, and least so among first-grade students, while rating 4 was most prevalent among first- and fourth-grade students, and least so among second-grade students.

The postural status of elementary school students was disturbed more than could be expected. When we have a mismatch between the phase of rapid growth, skeletal development and strengthening of muscle tissue, poor nutrition and lack of physical activity, then it is necessary to strengthen the weaker muscles of the abdominal and back muscles. In general, it can be said that students, in addition to regular physical education and health education, should also exercise regularly at home in order to positively influence their growth and development. The current situation imposes the need for a much more serious approach to this problem from all responsible entities. Only by mutual action and engagement of parents, educators and medical workers, as well as all those who work with children, can further disruption of the postural status of young people be stopped and the negative impact of an accelerated lifestyle be mitigated.

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