

## ANALYSIS OF POSTURE BY NAPOLEON WOLANSKI'S CRITERIA

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### Abstract

Posture refers to accustomed body position that a person takes standing, sitting, walking and in other activities. Right posture creates suitable conditions for the movement apparatus. The goal of this research is determining the condition and structure of the deviation of the posture of head, shoulders, chest, shoulder blades, spine, abdomen, legs and feet, as well as determining significant differences between the initial and the final measurement in the results of improper posture with students of classroom teaching. The research was conducted on a sample of 1105 students, of which are 563 boys and 542 girls, at the age of 5 to 12. This research program included students from first to fifth grade in eleven elementary schools in Sarajevo: "Kovačići", "Behaudin Selmanović", "Sokolje", "Dobroševići", "Safvet-beg Bašagić", "Zahid Baručija", "Fatima Gunić", "Aleksa Šantić", "Avdo Smajlović", "Mehmedalija Mak Dizdar", "Hamdija Kreševljaković". The diagnosis of posture condition was performed by Napoleon Wolanski's criteria (1975), which are based on determining segmented dimensions in mutual relations, 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). The analysis of the posture of the classroom teaching students was done with the help of the descriptive statistics of Wilcoxon's test. The significant value of the statistical relevance was researched on the level of  $p < 0.01$ . It is determined, with the variables analysis of the posture of certain body parts of the researched sample with the help of the descriptive statistics of Wilcoxon's test, that there is a statistically significant representation of improper posture, as well as the statistically relevant differences between the initial and final measurement in the results of improper posture with the classroom teaching students.

**Key words:** students of both genders, posture

### Introduction

Posture is a movement habit which is formed and changed during a lifetime of a person and has all features of the movement activity and the psychological state of an individual. Children's status becomes more and more current, regarding the way of living, so the teachers should know how to establish improper posture, so they could repress it properly.

Because of that versatile importance, posture stands out in Physical and Health Education of all ages, as an initial goal and a basic element of movement culture, because improper posture actually represents one initial stage of a certain deformity, such as: spinal deformities (scoliosis, lordosis, kyphosis), chest deformities (protruding chest, concave chest, flat chest), hip deformities (weak development, half-dislocation, dislocation), lower-extremity deformities («O» legs, «X» legs, saber legs), feet deformities (straight, raised).

With the data analysis of former researches and many systematical examinations, we can ascertain that there is an increasing number of children with improper posture. For these reasons there is a need for an increasing research of this scope. Deviations are classified by their size and are graded by so called negative points, wherein: 0 points – means there is no deviation, 1 point – means there is some deviation, 2 points – means there is larger deviation.

Maintaining the normal upright position is possible only if the locomotor apparatus is in good shape, regularly and proportionally developed, without a mechanical damage. Disproportions in the growth and development of articulated-skeletal and muscular system are especially expressed in the adolescence period, especially in its most intensive phase, the puberty. Exactly in that period of time the organism is very sensitive and susceptible to numerous negative influences. With the decrease of physical activity, the resistance of the locomotor apparatus to the influence of the external factors is also decreased.

Increased sensitivity of the organism of the adolescence period allows the appearance and development of many postural disorders (Jovović and Čanjak, 2010). That phenomenon today is more expressed than ever before, for many reasons. First of all, today the lifestyle of young people is characterised by lack of motion, in fact it becomes more sedentary. Almost one third of the children spends more than 4 hours a day sitting by the TV (Marshall, Gorely and Biddle, 2006), not counting the time spent in school, by the computer and video games. All of this tells us that the number of sedentary hours with children and young people, at home and school, is increasing (Lafond, Descarreaux, Normand and Harrison, 2007). Because of that, and also because of the fatigue that occurs during sitting for a long time,

the children very often have improper positions that later on turn into bad habits, and with time also in physical disorders, of easier or more serious form. Besides that, the way of coming to school and leaving the school is changed during the last years, mostly thanks to the growing number of cars. Unlike the earlier generations of students that went on foot to school, training, family visits, etc., often more than four and a half kilometres, children in the 21 century walk very rarely. Transportation from one place to another usually takes place by cars, buses, vans, etc. That kind of lifestyle, besides the number of comforts, has many consequences, that adversely affect the motor skills, postural status, and by that also the aesthetic appearance and life quality of a young person. This is supported by numerous researches by which the percentage of school children and young people with postural disorders go over 60% (Jovović, 19909; Radisavljević, Koturović and Arandelović, 1982). The most threatened group are exactly young adolescents (Jovović and Čanjak, 2010; Leskošek, 1976; Medojević and Jakšić, 2007).

A special problem is the fact that the number of children with posture problems is increased every year (Lafond and associates, 2007). Srđenović (1975) in cooperation with the teachers of physical and health culture in the training facility of the Academy of Teacher Education realised a program of tracking the posture lasting two years, depending on the influences of planned and continuously applied shaping exercises during educational process, on a sample of 329 students from fifth to eighth grade. Grading of eight segments was carried out by Wolansky's method (1975), before and after the experimental treatment (initial and final examination). After the final assessing, overall effects with the students, with regard to initial state amounted even to 31% in favor of proper posture. Paušić (2005) conducted a longitudinal study on a sample of 7-year-old children that just started going to school, and also followed the children during the three time points. The main goal of the research was to determine the state of anthropometric characteristics and parameters for the evaluation of physical posture with children starting school, and the state of the changes made in the same parameters in a period until going to the third grade. In order to realise the set goal we took a sample of 224 children, and two sets of variables. The first set was made of 17 anthropometrical variables, the other one from 14 variables for the evaluation of the posture. All the given results led to existence of connection of new school load on the inadequately prepared children's organism at the age of seven and eight. At the age of eight and nine it is noticed to a lesser extent adapting to the system for moving to already known school load. She found that in the first grade of the elementary school 51,58% of the children has asymmetry of the posture indicator. With those same children, a year later, that percentage grew up to 62,1%.

In the first grade, it is shown that 28,4% of the children has chest deformities, and after a year there has been a growth to 51,6%. Lowered feet with children is present in 47,3% in the first grade, and 60,7% of the children in the second grade. From the presented data it can be assumed that posture disorders of school children take an increasing share in the health status, which is very demeaning regarding the very age of the children. Kosinac & Katić (1999) by using a visual method in their work have estimated the posture of boys and girls at the age of 10 to 14. The testing was conducted by setting the examinees in the dorsal, and then in a side bets. The examiner subjectively graded the positions of certain body segments. Normal position is graded with 0, small deviations with 1, and bigger deviations with 2. They examined the posture of head, shoulders, shoulder blades, Lorenzo's angle, and kyphotic and lordotic components. The given results indicate to the existence of significant irregularity in the positions of graded segments of body. Similar results were given in researches of many authors. For example, Krsmanović (2007) states that 53% of the examinees has impaired posture, while some authors point out that even more than 70% of the school children has some kind of physical disorders and certain problems which are a consequence of lack of exercise (Ristić, Marković and Ljubić, 2002). Percent of representation of postural disorders with young people varies with different authors, and it depends on the specificity of samples, age, environment, applied methodology in detecting the disorders, etc. The goal of this research is determining the state and structure of the deviations of head posture, shoulder posture, shoulder blades posture, spine posture, stomach posture, leg posture and feet posture, and also determining the significant differences between the initial and final measurements in results of improper posture with students of classroom education.

## Methods

### *Examinee sample*

The research conducted N=1105 students of classroom education, of which 563 are boys and 542 are girls: 528 students from urban areas (261 girls and 267 boys) and 577 students from rural areas (281 girls and 296 boys) from 11 elementary schools in Canton Sarajevo and near it, of average age of  $M=8,2864$  years. These are students that go to I, II, III, IV and V grade.

### *Variables sample*

The following measuring instruments/tests are applied: Description of posture grade (ODT). The applied criteria is Wolansky's (1975) criteria for evaluation of mutual relations of 8 body segments with a visual projection of marked spots. The deviations are classified by their size, and are graded with so called negative points, by which: 0 points – means there is no deviation; 1 point – meant there is a slight deviation; 2 points – means there is a distinct deviation. 1) Head

posture grade – ODG (0 – Lowered line from the base of nose bone should fall on the upper half of the chest – sternum; 1 – The same line falls on a lower half of the chest; 2 – The same line falls in front of the chest bone); 2) Shoulder posture grade – ODR (0 – The central point of the shoulder joint (the top of the acromion) with a projection on the neck falls to the last half of the neck silhouette; 2 – The same spot „falls“ to the silhouette of the Adam's Apple); 3) Chest posture grade – ODGR (0 – The chest is harmonically, bell-like convex; 1 – The chest is flat; 2 – Deformity – „chicken“ breasts); 4) Shoulder blade posture – ODL (0 – Shoulder blades are pressed to the chest with its full length; 1 – „Winged“ blades, i.e. blades are isolated for examinees finger; 2 – The blades are isolated for two finger of the examinee); 5) Spine posture grade – ODK (0 – Physiological curve normal in sagittal and in frontal plane; 1 – First degree deviation: kiphosys, scoliosis or lordosis; 2 – The combination of the deviations or even individually, but on another level); 6) Stomach posture grade – ODTR (0 – Stomach reentrant behind the normal, lowered behind processus xiphoideusa in sagittal plane; 1 – The stomach bulging in front of the lowered normal; 2 – Hanging stomach (pear-shaped) or relaxing muscles); 7) Legs posture grade – ODN (0 – Normal heel posture: knees vertically straight or atleast approximately; 1 – Normal heel posture: knees tend to „X“ shape and touch; 2 – Heel posture: significant knee tendence to „X“ that is significant tendence to „0“ if thicker two examinee's fingers); and 8) Feet posture grade – ODS (0 – Walkway surface of the feet only on 1/3 transverse line. It is graded by measuring the foot print; 1 – Walkway surface affected also the other third; 2 – Walkway surface affected also the third third of the surface). Remark 8: The evaluation of the status of the instep is calculated by Thomson's method. Thomson's feet index (%) is obtained in such way that on the planthogram the most prominent heel and metatarsus parts on the inner side of the feet are joined (line A-B).

Then we find the middle of the heel and we draw a line (Mayer's line) from the middle of the heel to the outer edge of the third toe. From Mayer's line to the most extent part of the longitudinal vault, on the planthogram, draw a normal and measure its value („a“). From the vertex of the normal („a“) draw another normal to the line AB and measure its value („b“). The index of the subdued feet will be achieved when these two values are set in a relation:  $I = (a/b) \times 100 = \%$  - the given percent of the subdued feet of every foot of every individual, on which the scoring is based: 0 – points to 30%, 1 – point for 30 to 60 %, 2 – points over 60%. Determining the general grade of posture was conducted according to the criteria of Napoleon Wolanski (1975): excellent (0 points), very good (1-4 points), good (5 – 8 points), weak (9 – 12 points), very weak (13 – 16 points). The relation is 0 points (minimum) to 16 points (maximum). The evaluation of feet vaults is realised by the method of planthography.

The index of the subdued feet is determined by using Thomson's method.  $I = (a/b) \times 100 = \%$  - the obtained percent of subdued feet of every foot of every individual, on what the points are given: 0 – points to 30 %, 1 – point from 30 to 60 %, 2 – points over 60 %.

#### *Work program*

The work program that was realised in this research lasted one school year 2011/12. The work program is conceived as follows: At the beginning of the school year in September, initial measuring of posture is conducted by Napoleon Wolanski's criteria (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 – stomach posture (ODTR), D7 – legs posture (ODN), D8 – feet posture (ODS), with the help of the professors of physical and health culture. The examinees exercise following the program of elementary games made to prevent and correct the improper posture, that were made after the initial measuring. The conception of elementary games program is made in such way that it is conducted in forms of applied activities in physical and health culture of students in classroom teaching. Every exercising started with physiological and emotional preparation of the organism. Cardiovascular introduction of load functions that are yet to follow represented the beginning physiological load. Emotional introduction to this kind of special program had an extraordinary value. Every exercise was conducted from easier to harder. To get the best possible effect special attention was given to: concrete demonstration of exercises (elementary games), because it was about strictly defined moves. Because of that, after the demonstration and explanation of the teacher, the students tried to do a certain task. The explanations were short and regarded the way of conducting and the goal of certain games with respect to student's age. The program content was not static, because elementary games were applied in order to correct and prevent the present disorders, they changed and accustomed to given situations, complemented, depending on student's motivation, because in time some games become monotoneous to students if they are repeated every day, and in that way there is less attention on the right performing of the moves. After the initial measuring, a program that lasted 6 months (31 week) was conducted.

The program was realised in period (October, November, December, February, March, April, school year 2011/12.), where teachers/professors of classroom teaching worked. The number of training units: two times a week classes of physical and health culture, where elementary games were applied in function of prevention and correction of improper body posture. Classes lasted for: 45 minutes. At the end of the school year in May, final measuring of posture was conducted by Napoleon Wolanski's criteria (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 – stomach posture (ODTR), D7 – legs posture (ODN), D8 – feet posture (ODS), with the help of the professors of physical and health culture. Testing and measuring did were not included in the 6 month program, and they were conducted before and after the program was applied. After initial and final testing and measuring, the evaluation was made.

## Results and discussion

In this chapter we displayed frequency allocation of some grades of body parts posture in initial and final measuring with students of classroom teaching.

Table 1 The display of frequency allocation of some grades of body parts posture in initial and final measuring

Body part	Posture measuring				
	Grade (score)	Initial		Final	
		F	%	F	%
Head	0	549	49,7	797	72,1
	1	440	39,8	308	27,9
	2	116	10,5	0	0,00
	Total	1105	100,0	1105	100,0
Shoulders	0	629	56,9	835	75,6
	1	429	38,8	270	24,4
	2	47	4,3	0	0,00
	Total	1105	100,0	1105	100,0
Chest	0	874	79,1	982	88,9
	1	16	1,4	11	1,0
	2	215	19,5	112	10,1
	Total	1105	100,0	1105	100,0
Shoulder blades	0	700	63,3	934	84,5
	1	380	34,4	171	15,5
	2	25	2,3	0	0,00
	Total	1105	100,0	1105	100,0
Spine	0	473	42,8	679	61,4
	1	422	38,2	426	38,6
	2	210	19,0	0	0,00
	Total	1105	100,0	1105	100,0
Stomach	0	716	64,8	890	80,5
	1	221	20,0	215	19,5
	2	168	15,2	0	0,00
	Total	1105	100,0	1105	100,0
Legs	0	838	75,8	973	88,1
	1	149	13,5	76	6,9
	2	118	10,7	56	5,1
	Total	1105	100,0	1105	100,0
Feet	0	434	39,3	666	60,3
	1	416	37,6	436	39,5
	2	255	23,1	3	0,3
	Total	1105	100,0	1105	100,0

In Table 1 the deviations are clearly displayed, that are classified by their size and graded with so called negative points, wherein: 0 points means there is no deviation, 1 point means small deviation, while 2 points mark extreme deviation. Based on the given results we can conclude that deformity is present in every part of the body, in some degree, when talking about students from first to fifth grade of elementary school. Also, those deformities are in smaller extent and less represented in final measuring.

With the mark for head posture of students from I to V grade of elementary school, we came to data that show that in the initial measuring 549 (49,7%) students have lowered normal that from the base nose bone falls to upper half of the chest bone (sternum), which means that there is no deviation. With 440 (39,8%) students the same normal falls to the lower half of chest bone, which indicates a slight deviation, and 116 (10,5%) student have extended deviation, because the same normal falls in front of the chest bone. In final measuring 797 (72,1%) students have lowered normal that falls from base nose bone to the upper half of chest bone (sternum), which means there is no deviation. With 308 (27,9%) students the same normal falls on the lower half of chest bone, which indicated a slight deviation, while extreme deviation, where the same normal falls before the chest bone, was not represented in the final measuring. What caused high percent of suppressing the head forward, was high headboard and too soft bed, especially with children that sleep on their back. Today's youth grows faster, biological development is speeding up, but the strength of their muscles does not follow their fast growth.

Rare body movement and modern lifestyle affect the low muscle development. With children that have undeveloped musculature, characteristically bad posture is formed, and in puberty (from 11 to 14 years) because of the more intense work of sex glands, weight gain and shortage of physical activity lead to frequent posture disorders. It is necessary to point out the importance of exercising and game application (elementary) for the health of the children and in that way enable the necessary locomotion for the students. The mark of shoulder posture of students from I to V grade of elementary school, led to data that show that in initial measuring with 629 (56,9%) students the central point of shoulder joint (the top of acromion) with projection to the neck „falls“ to the last half of neck silhouette, that indicates a slight deviation, and with 47 (38,8%) students the same spot „falls“ in Adam's apple silhouette, which indicates extreme deviation.

In the final measuring with 835 (75,6%) students the central point of the shoulder joint (the top of acromion) with projection to the neck falls to the last half of the neck silhouette, that indicates to proper shoulder posture. With 270 (24,4%) students the same point „falls“ to the front neck silhouette, which indicated a slight deviation, while extreme deviation, where the same point „falls“ to Adam's apple silhouette, was not represented in the final measuring. High percent of shoulder blades deformities arises because of the fast growth phase, improper sitting at school, inadequate furniture used at home and school, inadequate bags children carry in hand or on one or both shoulders, bad clothes that is squeezing the body and the shoulders, and also the inadequate shoes, bad food and timidity of children to secondary changes that happen.

The mark of chest posture of students from I to V grade of elementary schools, led to information that indicates that in initial measuring 874 (79,1%) students have a harmonious, bell-like bulging thorax, which means there is no deviation. 16 (1,4%) students have a flat thorax, which means there is a slight deviation, and 215 (19,5%) students have a deformity („chicken” breasts), which indicates to extreme deviation. In the final measuring 982 (88,9%) students have a harmonious, bell-like bulging thorax, which means there is no deviation. 11 (1,0%) students have a flat thorax, which means there is a slight deviation, and 112 (10,1%) students have a deformity („chicken” breasts), which indicates to extreme deviation. The mark of shoulder blades posture with student from I to V grade in elementary schools, led to information that indicate that in initial measuring with 700 (63,3%) students the blades rest on the thorax with their entire surface, which means there is no deviation. 380 (34,4%) students have their blades isolated for one finger of examinee, so called „winged” blades, what indicates to a slight deviation, and 25 (2,3%) students have their blades isolated for two fingers of examinee, what indicates that the deviation is extreme.

In final measuring 934 (84,5%) students have blades that rest on the thorax with their whole surface, what indicates that there is no deviation. 171 (15,5%) students have their blades isolated for one finger of examinee, so called „winged” blades, what indicates to a slight deviation, while the extreme deviation, where the blades are isolated two fingers of examinee, was not represented in the final measuring. The mark of spine posture with students from I to V grade of elementary school, led to information that indicate that in initial measuring 473 (42,8%) have a normal physiological curve both in the sagittal and in the frontal level, what indicates the proper posture. The proper posture should be on the very top, because it is the basic condition of good health, normal growth and development and nice looks of every student. It is realised with regulation of muscle tonus ( neck, back, stomach, thighs, lower legs, feet vault), to reduce and neutralise the effect of gravity. That is a moving skill that is being formed and changed during the whole life of a person and carries all the features of movement activity and psychological condition of an individual. Body posture provides conditions of efficient functioning of the internal organs (cardiovascular and respiratory). On the mechanisms of body posture regulation of moving is created on which depends the efficient detection of the possibilities of the whole moving apparatus. 422 (38,2%) students have a first degree deviation: kyphosis, scoliosis or lordosis, and 210 (19,0%) students have a combination of deviations or even individually, but of second degree. Improper body posture with students of classroom teaching is often an indicator of health problems. Those problem can get very serious if they are not solved in time.

In the final measuring 679 (61,4%) students have a physiological curve normal both in sagittal and frontal level, what indicates to proper body posture. 426 (38,6%) students have a first degree deviation: kyphosis, scoliosis or lordosis, while the extreme deviation, combination of deviations or even individually, but on a second degree, was not present. The reason of this kind of results is in the first place excessive obesity, weak muscles, inappropriate shoes, early forcing to walk, static load of feet, using the means of transport, carrying or holding heavy objects, etc. Feet exercises should be done every day in school with children, because they are a significant prevention of injuries and it is a way to strengthen the muscles of feet and joints.

The mark of stomach posture of students from I to V grade in elementary schools led to information that indicates that in the initial measuring 716 (64,8%) students have a stomach pulled in behind normal, lowered behind processus xiphoideus in the sagittal level what indicates that there is no deviation. 221 (20,0%) students have their stomach bulging before the lowered normal, what indicates to slight deviation, and 168 (15,2%) students have a „hanging” stomach and flabby muscles, what indicates to extreme deviation. In the final measuring 890 (80,5%) students have their stomach pulled in behind normal, lowered behind processus xiphoideus in the sagittal level what indicates that there is no deviation. 215 (19,5%) students have their stomach bulging before the lowered normal, what indicates to a slight deviation, while extreme deviation, „hanging” stomach and flabby muscles, was not present. The mark of legs posture with students from I to V grade of elementary schools led to information which indicate that in the initial measuring 838 (75,8%) students have a normal heel posture: knees vertically straight or at least approximately, what indicates that there is no deviation. 149 (13,5%) students have a normal heel posture: knees tending to „X” shape and connect, what indicates to a slight deviation, and 118 (10,7%) students have a heeled posture: significant tendency of the knees to „X”, that is significant tending to „0” for bigger thickness of 2 fingers of examinee, what indicates to an extreme deviation. In the final measuring, 973 (88,1%) students have a normal heel posture: knees vertically straight or at least approximately, what indicates that there is no deviation. 76 (6,9%) students have a normal heel posture: knees tending to „X” shape and connect, what indicates to a slight deviation, and 56 (5,1%) students have a heeled posture: significant tendency of the knees to „X”, that is significant tending to „0” for bigger thickness of 2 fingers of examinee, what indicates to an extreme deviation. The mark of feet posture with students from I to V grade of elementary schools led to information which indicate that in the initial measuring 434 (39,3%) students have a well formed foot, that is, the walkway surface of the foot is only at 1/3 of transverse line.

It is marked by measuring of the foot print. With 416 (37,6%) students, walkway surface has affected also the second third, while with 255 (23,1%) students the walkway surface has affected also the third third of the surface. In the final measuring 666 (60,3%) students have a well formed foot, that is, the walkway surface of the foot is only at 1/3 of transverse line. With 436 (39,5%) students, walkway surface has affected also the second third, while with 3 (0,3%) students the walkway surface has affected also the third third of the surface. From the given results it can be concluded that with students from I to V grade the most endangered is deet and spine posture, and the least is chest posture. Many authors got similar results in their research. For example, Krsmanović (2007) states that 55% of the examinees have impaired body posture, while some authors point out that even more than 70% of school children have some physical disorders and certain problems that are a consequence of lack of moving. (Ristić, Marković and Ljubić, 2002; Velitčenko, 1993).

The percent of representation of postular disorders of young people in significant degree varies with different authors, and it depends on the secificity of samples, age, life environment, applied methodology in detecting disorders etc. That way, for example Ulić, Protić-Gava and Ibročić (1995) found improper body posture on a sample of rowers between 14 and 22 years old, even with 87% of examined cases. The results (Jovović, V., Čanjak, R., 2012) have indicated that the posular stats is very neglected with a great number of examinees of both genders. It is determined that the greatest number of examinees have a compromised status od spine and blades. Great frequency have also shown the disorders of lower extremities „O“ leg and flat foot. The presence of other deviations is lower, where in bulged and protruding chest are least represented disorders with the examined cases, especially with girls. It is shown that bya far the largest percent of deviations are functional disorders, that could be corrected with the adequate application of physical treatment, what collides with results of some earlier researches. It is interesting to notice that winged blades, scoliosis and kiphosis indicate to significantly greater frequence with male examinees. Insufficient capacity of muscle strength leads to faster fatigue, and often there are disorders onthe spine and the blades, what is a result of insufficiency of ligament-muscular apparatus under the conditions of faster growth. The results of the research have shown that with girls more frequent is lordosis, which is, as supposed, related to the way of body posture characteristic to a great number of women. Postular disorders of the lower extremities, especially „O“ legs and flat foot are represented in great number with examinees of both genders. The frequency of other physical disorders is slighly smaller. It is shown that bulged and protruding chest are the least repsresented physical disorders with examinees of both genders.

Based on more detailed analysis it can be seen that the frequency, structure and level of representation of postular disorders are in a significant degree different between boys and girls, at this age. The results of the research have shown that „X“ legs, hollowed foot, hollowed and protruding chest are least represented physical disorders with examinees of both genders. However, chest disorders are in higher degree represented with boys, in regard to girls (Bogdanović and Milenković, 2008; Jovović, 1999; Karaleić, 2006; Medojević and Jakšić, 2007). Comparing with the results that were done for the school kids of V, VI, VII i VIII grade in elementary school in Tuzla (Graduate work Murić, N., 1999), it can be ascertained that with the girls from V grade, most threatened is stomach posture, and the least threatened is chest posture, while later the relations change.

With the boys, the most threatened is stomach and blades posture, and the least threatened is chest posture, what partially collides with my results. Based on the given results it can be concluded that improper posture is present in high degree, because the characteristics of the environment affects the lifestyle, and also the body posture that later on affects the life cycle of every individual. Such high degree of deformity can be explained with lack of sports, negative effects of the environment and incorrect nutrition. The consequence of that is today's lifestyle, that is everyday activities with too little movement and excessive and inappropriate nutrition. It leads to an unhealthy lifestyle, which indicates the need of intervention and change of behaviour and conducting a healthy way of living in order to protect and improve health, that is based on healthy nutrition, drink and moving. It is predicted that the number of these children is going to be bigger and bigger if the significance of play is not realized, and also the physical exercising in school that has a great influence on the health of children. It is necessary to realize how big the significance of playing and exercising is for the health and it is a need in every individual's life. Increasing physical exercising causes impovement of health status of an individual in any life period, because person's health depends on its sporting. Otherwise, it leads to improper body posture and dormities, that have become a great problem of health of human organism. We raise new generations on bad and wrong principles.

Weak back with school children are overloaded with school books, and parents do not have enough time to wash a fruit for their children's lunch, but they buy a big bag of chips, a hamburger and a Coca-cola, and when they get back home, they let them rest by the tv and the computer, insted of some sport. That is how, out of healthy children, we make sick children, with diabethes, high blood pressure, kyphosis, scoliosis or lordosis, flat feet and predisposition for everything except a healthy and normal life.

Healthy way of living including regular exercising and good nutrition can affect the optimal growth and usage of maximal genetic potential for development: nervous, skeletal, hormonal and cardio-respiratory system. Sports and playing in school is of great importance, because besides the preservation of health, prevention of improper posture, it provides support and assistance in the natural growth and development, in accordance with their abilities and interests, to forward them to a healthy lifestyle, and to create a habit for everyday use of values of motion activities.

Table 2 Display of values of an average range grades (score) of posture of certain body parts in initial and final measuring

Body part	Measure	Average	Range
Head	Initial	181,46	63331,00
	Final	167,50	2010,00
Shoulders	Initial	138,00	36432,00
	Final	138,00	1518,00
Chest	Initial	54,50	5886,00
	Final	0,00	0,00
Blades	Initial	139,00	37252,00
	Final	139,00	1251,00
Spine	Initial	232,03	101860,00
	Final	231,50	5556,00
Stomach	Initial	179,50	62825,00
	Final	179,50	1436,00
Legs	Initial	69,50	9591,00
	Final	0,00	0,00
Feet	Initial	242,00	116886,00
	Final	0,00	0,00
Whole body	Initial	287	2583,0
	Final	328,31	186837,0

From the listed table of average ranges it is seen that in the final measuring occurred a change of values of the degree of certain body parts in relation to initial measuring, because the application of elementary games in class TZK had a great significance in making habits for a healthy and hygienic life and prevention of improper body posture. And elementary game activates a complete locomotor system crucial for the transformation of energy that is highly needed for the activity of every cell in the organism, so the games and physical activity can be treated as an entry for a harmonious development of every child's characteristic. The ranges of those values are smaller in the final measuring and to examine the significance of the change of values, Wilcoxon's test of differences in ranges of dependent samples was used. The results of the analysis are listed in the next table.

In table 4 it is displayed the general mark of body posture with students from I to V grade of elementary school and by the criteria of (Wolanski 1975), where in the initial measuring 116 students or 10,5% have an extraordinary body posture, 483 students or 43,7% have a very good body

posture, 440 students or 39,8% have a good body posture, 64 students or 5,8% have a bad body posture, and 2 students or 0,2% have a very bad body posture. In the final measuring 279 students or 25,2% have an extraordinary body posture, 728 students or 65,9% have a very good body posture, 98 students or 8,9% have a good body posture, while bad and very bad body posture was not present in the final measuring.

Table 3 The list of values and levels of the significance of Wilcoxon's test in testing the differences of average range of grades (points) of some body parts posture in initial and final measuring

Body part	Z-value	Level of significance
Head	-17,25	0,000 **
Shoulders	-15,26	0,000 **
Chest	-10,17	0,000 **
Blades	-15,56	0,000 **
Spine	-19,27	0,000 **
Stomach	-18,08	0,000 **
Legs	-10,54	0,000 **
Feet	-21,96	0,000 **
Whole body	-23,39	0,000 **

\*\* Z-expression is statistically significant on a level lower than 1%

Every one of Wilcoxon's Z-expressions is statistically significant on a level lower than 1% and it can be concluded that for every body part it came to a significant decrease of values of deformity degree in the final measuring in relation to the initial measuring.

Table 4 The list of the distribution of frequencies of grades of body posture in initial and final measuring

Grade (score)	Body posture measuring			
	Initial		Final	
	F	%	F	%
1 (13-16)	2	0,2	0	0,00
2 (9-12)	64	5,8	0	0,00
3 (5-8)	440	39,8	98	8,9
4 (1-4)	483	43,7	728	65,9
5 (0)	116	10,5	279	25,2
Total	1105	100,0	1105	100,0

The relation is 0 points (minimal) to 16 (maximal). From the listed table of distribution of frequencies of some grades of body posture in initial and final measuring has the most 4 and 5 marks, regarding that the lower marks were more represented in the initial in regard to the final measuring. Comparing to the information worked for preschoolers of kindergarden Srećica and Labudovi in Sarajevo (Hadžikadunić, M., Balta, S., 2000), it can be ascertained that the largest number of children is with very good body posture, and then good. Very bad body posture on examined samples was not shown, which completely coincides with our given results.

## Conclusion

The main goal of this research was to determine the condition and the structure of deviations of postures of head, shoulders, chest, blades, spine, stomach, legs and feet, and also to determine the significant differences between the initial and final measuring in results of improper body posture with the students of classroom teaching. The research was conducted on a sample of 1105 students, of which 563 were boys and 542 were girls, at the age of 5 to 12.

Based on the given results of the descriptive statistics of the marks of some body parts posture of students in initial and final measuring, i.e. before and after the realization of the program it can be concluded that the improper posture is present in great extent with students from I to V grade of elementary schools, because the characteristics of the environment affect our way of life, and also the body posture that is later affected on the life cycle of every individual. Based on the tables on the descriptive level it can be concluded that there are also statistically significant differences between the initial and final measuring in the results of improper body posture, i.e. for every body part, head, shoulders, chest, blades, spine, stomach, legs and feet, the deformity was present in a certain percent, but those deformities are expressed in a smaller extent and less represented in the final in regard to the initial measuring. In the final measuring it led to a significant reduction of the number of points in the general evaluation of body posture in relation to the initial measuring.

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According to the distribution of the grades in initial and final measuring, it can be concluded that higher grades are significantly more represented in the final, and lower grades in the initial measuring. So, the students had better grades of body posture in final in regard to the initial measuring. It is obvious that the postural status with students of classroom teaching is compromised more than it could be expected. The existing situation imposes the need of considerably more serious approach to this problem from every responsible subjects. Only with mutual activity and engagement of the parents, teachers and medical workers, and everyone that works with children, further disruption of postural status of the young people can be stopped, and we could ease the negative influence of „contemporary“ lifestyle. This problem did not appear overnight, but it was indicated for years. It is certain that every year the situation is getting worse, and so if appropriate and concrete measures are not taken, we should not expect any significant changes in a positive sense.

Most of the researches of this kind unfortunately stay anonymous to the public, or in the best case this problem gets devoted some smaller paper article. It is certain that in solving this problem a very great part should have the media also, because we know their effect to the public opinion. Permanent warnings of the leading experts from the appropriate authorities via broadcasting means and printing, with time can awaken the awareness of the citizens about the need for bigger concerns directed to forming the right body posture with children, since the earliest days.

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## ANALIZA DRŽANJA TIJELA PO KRITERIJIMA NAPOLEONA WOLANSKOG

### Sažetak

Pod držanjem tijela misli se na naviknuti položaj tijela koji čovjek zauzima stojeći, sjedeći, u hodanju i drugim djelatnostima. Pravilno držanje tijela stvara povoljne uvjete za kretni aparat. Cilj ovog istraživanja je utvrđivanje stanja i strukture devijacija držanja glave, ramena, grudi, lopatica, kičme, trbuha, nogu i stopala, kao i utvrđivanje značajnih razlika između inicijalnog i finalnog mjerenja u rezultatima nepravilnog držanja tijela kod učenika razredne nastave. Istraživanje je sprovedeno na uzorku od 1105 učenika, a od toga 563 dječaka i 542 djevojčice, u starosnoj dobi od 5 - 12 godina. Programom istraživanja obuhvaćeni su učenici od I do V razreda u jedanaest osnovnih škola u Sarajevu: OŠ "Kovačići", OŠ "Behaudin Selmanović", OŠ "Sokolje", OŠ "Dobroševići", OŠ "Safet-beg Bašagić", OŠ "Zahid Baručija", OŠ "Fatima Gunić", OŠ "Aleksa Šantić", OŠ "Avdo Smailović", OŠ "Mehmedalija Mak Dizdar", OŠ "Hamdija Kreševlajković". Dijagnosticiranje stanja držanja tijela je izvršeno po kriterijima Napoleona Wolanskog (1975), koji se baziraju na utvrđivanju segmentarnih dimenzija u međusobnim relacijama, kako slijedi: D1 - držanje glave (ODG), D2 - držanje ramena (ODR), D3 - držanje grudi (ODGR), D4 - držanje lopatica (ODL), D5 - držanje kičme (ODK), D6 - držanje trbuha (ODTR), D7 - držanje nogu (ODN), D8 - držanje stopala (ODS). Analiza držanja tijela kod učenika razredne nastave urađena je uz pomoć deskriptivne statistike i Wilcoxonovog testa. Signifikantna vrijednost statističke značajnosti istražena je na razini  $p < 0.01$ . Analizom varijabli držanja pojedinih dijelova tijela istraživanih uzorka uz pomoć deskriptivne statistike i Wilcoxonovog testa, utvrđeno je da postoji statistički značajna zastupljenost nepravilnog držanja tijela, kao i statistički značajne razlike između inicijalnog i finalnog mjerenja u rezultatima nepravilnog držanja tijela kod učenika razredne nastave.

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