

POSTURE AS MALFUNCTION OF FEMALE PUPILS MUSCULOSKELETAL SYSTEM IN PUBESCENT AGE

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Abstract

Aim research is identify and point out the level of musculoskeletal system of female pupils of second degree of primary school with an intention to posture. Posture disorders are widespread in all age groups, but the upward trend over the last decade can be seen even in the school population, we therefore focus in terms of the training of prevention is focused on the status, the level of the individual segments of the body posture with standardised method for the seven grades of primary school female pupils in Liptovský Mikuláš, where the total group was consisted of 69 female pupils. Our survey indicates significantly ($p < 0,01$) on good posture of the monitored group (60,49%). In each of the areas we examined significant changes in the amendments of physiological curvature of the spine in a sagittal and a lateral plane, which showed a slightly enlarged kyphotic curvature ($\text{Chi} = 7,989$; $p < 0,01$) and position of the arms and scapula ($\text{Chi} = 7,551$; $p < 0,01$). Research showed the most problematic segments of the posture in oru monitored group of female pupils were significantly ($p < 0,01$) area of the head, shoulders and scapula, which were reflected in the slightly enlarged chest kyphosis. Symptom of these disorders is back pain, which may later show in adulthood as a vertebral disorders of musculo-skeletal system, which are a often reason for visits to a doctor and sick leave.

Key words: **Posture, Female pupils, Malfunction, Musculoskeletal system**

Introduction

The current hypodynamic and hypocinetic lifestyle of children and youth (Łubkowska & Tarnowski, 2012; Pupiřová, 2013, 2014) is reflected in the upward trend in civilisation diseases, to which belong as well functional disorders in the area of musculoskeletal system (Kanášová, 2005; Pupiřová & Pupiř, 2013), where belongs also the muscle imbalance. Thurzová (1992) defines a muscle imbalance as a disorder of function balance of the muscles and balance disorder in the effect on the joint. It is imbalance in the system of tonic (postural) and phasic muscles. Buran (2002) along with the other authors considered it as crucial cause of chronic pain of the locomotive system and disorders of the spine. Adversely affects the posture, locomotive stereotypes, muscle coordination, increases susceptibility to injury and limiting the range of motion in joints (Korčok & Pupiř, 2006; Véle, 2006; Pivovarniček et al., 2013a,b). The outer manifestation of the interplay between the postural and phasic musculature is a posture that represents a relatively correct arrangement of individual segments of the body while standing, sitting, walking or doing other movement, which involved (Čermák, 2005):

- head position
- the determining factor for the posture is the spine, the axis of the body,

- a big influence on posture has position of pelvis and lower limbs,
- the last component is position of the foot arch and information input.

From the foregoing follow that one of the most important locomotive mechanisms is antigravity-postural mechanism, i.e. the holding of upright figure. In this context, it is necessary to point out the optimum level of mobility of the spine, which is considered to be one of the basic assumptions of the correct posture.

The spine is to be understood as one coherent body, which provides a number of features:

- provide upright posture,
- is co-creator of movement,
- protects an important part of the nervous system (spinal cord and spinal roots).

At the same time spine contributes to the security of the balance, ensures the horizontal position of the eyes and head and it participates on balance holding . At the moment we are talking about diseases of the spine as a civilisational diseases. These disorders occur more often at an earlier age, in particular, due to lack of support of the spine, which in the first stage are as functional disorders of posture, where faulty (wrong) posture is essentially a

disorder of the postural functions of the system. Outwardly it is manifested by changes in the shape of the body, which are caused by shortening or weakening of some muscle groups and non-physiological curvature of the spine (Vojtaššák, 2000).

Functional disorders of the locomotive system are reflected in threesystematic, interrelated levels (Kolář, 2001):

- a) in the area of muscle function as *muscular imbalance*,
- b) in the area of central control as disorders of *locomotive stereotypes*,
- c) in the area of joint function as *limitation of joint mobility or hypermobility*.

The most common symptom in the spine disorders is pain. This is a subjective feeling, from mild discontent to devastating feeling (Hart et al, 1995; Thurzová, 2003). Therefore the intensity of pain feeling does not always correspond to the severity of the damage of the spine (Buran, 2002). This is a serious economic problem, which shows also figure 1, in which is displayed an increasing number of accepted disabilities because of diseases of the spine in an interval of five years.

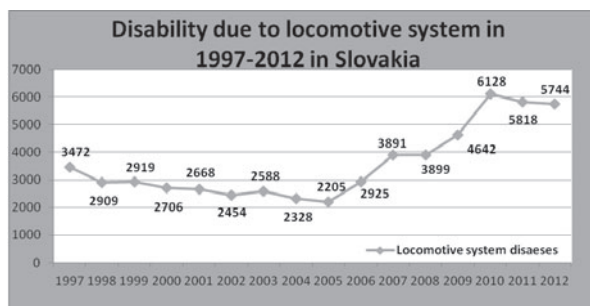


Figure 1. Disability due to locomotive system in 1997-2012 in Slovakia

Functional disorders in children and youth in the area of the musculoskeletal system are subjects of interest not only for domestic (Hubinák, 2007; Kopecký, Ely, 2007; Bendíková, 2011; Kabátová et al., 2012) but also foreign authors (Chen et al., 1998; Kania & Gudzio-Wiernicka, 2002; Żukowska, Szark-Eckardt, Muszkiet, & Iermakova, 2014; Kovač, Kajmović, Rađo, & Manić, 2014). High representation of incorrect posture in the population of pupils is currently significantly determined by the lack of physical activity (Bendíková & Kostencka, 2013). The correct stereotype of the posture is, amongst other features, an assumption for the optimal operation of the internal organ systems (especially respiratory and cardio-vascular).

The effects of muscle imbalances and dysfunctions in spine resulting from the change in the momentum and in the function of the musculoskeletal system, disorders in statics and dynamics. There is a nonphysiological load on the individual parts of the joints, followed by their functional remodeling, which can then cause premature de-

generative changes. The lack of primary prevention leads to the formation of vertebral diseases in adulthood, which (Buran, 2002):

- are the leading cause of work disability in people over 45 years old,
- in the cause of hospitalization are on 5.-6. place,
- 60-90% of the population had or has vertebral difficulties,
- within the framework of rehabilitation ambulances are 70% of the patients in Slovakia with the spine diseases .

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Aim research is identify and point out the level of musculoskeletal system of female pupils of second degree of primary school with an intention to posture. Due to the prevalence of bad posture we expect an occurrence of functional disorders in posture of monitored group.

Methods

Exploratory group was consisted of 69 female pupils in pubescent age from Liptovský Mikuláš, who were willing to participate in the survey with the participation of a doctor (specialist) and teacher of physical education and sports. These were female pupils of seventh classes of primary school, second grade, in the number of 69, whose average age was 13,5 years. The primary characteristics of the group presents in Table 1.

We carried out a survey in the 3 primary stages where in the second stage we realised evaluation of musculoskeletal system with intention on posture, with the help of a doctor and support of a teachers in the school year 2013/2014, in March 2014. It was realised in the specialist ambulance – ortopedist, with Thomas - Klein method modified by Mayer (in Hošková & Matoušová, 2005).

Table 1. Characteristics of the file (n = 69)

N = 69 / factors	Body height/cm	Body weight/kg
	160,6	56,5
Age	13,5 years	
BMI kg/m ²	23,3	

Posture is divided into 4 stages: 1. Excellent, 2. Good, 3. Poor, 4. Incorrect, where each grade of posture has 5 characters and is evaluated by mark (1 to 4):

1. Holding of the head and neck
2. The shape of the chest
3. The shape of the abdomen and pelvis inclination
4. The total curvature of the spine
5. The height of the shoulders and the position of the scapula

The classification of the posture:

- I. Excellent posture 5 points
- II. Good (almost perfect) posture 6 – 10 points
- III. Poor posture, 11 – 15 points
- IV. Incorrect posture 16 – 20 points

In evaluation of lower limbs position we came out in varus from the distance between the inner parts of knee joints, while the in valgus distance from the internal ankles distance in a standing position.

To assess degrees of posture in pupils younger school age, we used the Chi-square test on 1% ($p < 0,01$) and 5% ($p < 0,05$) level of statistical significance. Next, we used methods of logical analysis and synthesis using the inductive and deductive methods, comparisons and generalizations. All data were percentage processed and compared with available literature.

Results and discussion

On the basis of partial aim and tasks of the paper, we present a part of the results, which are subject to further exact tracking and processing. We cannot generalize presented results, but it is necessary to understand them in the total context as an informative and basic in the organisation of leisure time in relation to health.

We found in our group at the general classification of posture (Table 2) significantly ($p < 0,01$) the highest percentage representation in II. qualitative grade, which is characterized as a good posture, where we recorded 60,49 % female pupils. In I. qualitative grade, which is characterized as a great posture we have seen in our group 14,37 % female pupils, while in the III. qualitative grade 23,70 % for which is characteristic poor posture. The lowest percentage we found in IV. qualitative grade (1,44%), which we consider as a positive. At the same time we can say, that good posture has not only aesthetic but also power-economic requirements, which is a reflection of the external and internal environment - homeostasis.

Table 2. Classification of posture in female pupils ($n = 69$)

Evaluation/Sex	I. Excellent posture to 5 points	II. Good posture 6 - 10 points	III. Poor posture 11 - 15 points	IV. Incorrect posture 16 - 20 points
Girls	14,37 %	60,49 % **	23,70 %	1,44 %

Legend: ** $p < 0,01$

We consider the overall level of posture in our group of female pupils in the light of our findings as a positive due to the findings of other authors (Vargová & Veselý, 2002; Adamčák, Bartík, Kozanáková, 2011), who point to an increase in the incorrect posture in pupils not only in the secondary but also in primary schools.

We found in each of the areas of posture the following. In the area I. evaluation of head and neck holding (Table 3)

We found in our group of female pupils, that with mark 1 was ranked only 6,9%, while with mark 3 half of the female pupils (50%; $\text{Chi} = 7,878$; $p < 0,01$). With mark 2 was ranked 38,8 % ($p < 0,05$) and with mark 4 only 4,31 %.

Table 3. Head and neck holding in female pupils ($n = 69$)

Girls/evaluation	Mark 1	Mark 2	Mark 3	Mark 4
$n = 69$	6,9 %	38,8 % *	50 % **	4,31 %

Legend: ** $p < 0,01$; * $p < 0,05$

We found in the area II. chest evaluation IN our group of female pupils (Table 4), that with mark 1 was evaluated only 3,45 %, where we found the symmetrical chest, well arched, using intercostal part for breathing.

Table 4. Chest evaluation of female pupils ($n = 69$)

Girls/evaluation	Mark 1	Mark 2	Mark 3	Mark 4
$n = 69$	3,45 %	82,76 % **	12,07 %	1,72 %

Legend: ** $p < 0,01$

We evaluated with mark 4 only 1,72 % female pupils. The highest percentage and significance ($\text{Chi} = 9,913$; $p < 0,01$) we found in mark 2, what we consider as positive. With mark 3 was evaluated by a doctor 12,07 % of female pupils.

On the prevalence of asymmetric hull in children aged 8 - 14 years old points also Tisovský et al. (2004). We add, that the position of the chest plays an important role in the respirator, but also for the imposition of various internal organs in the thoracic spine box, which has the protecting function.

Another monitored area was the evaluation of the abdomen and the slope of the pelvis (Table 5), which we evaluate as positive in the light of our findings and also in the light to other authors (Kováčová, 2004). While with the mark 1 was evaluated 15,52 % of female pupils, with the mark 2 it was 75,86 % ($\text{Chi} = 8,326$; $p < 0,01$) of female pupils. With the mark 3 was evaluated only 7,76 % of female pupils. Correct posture is conditional upon the right curvature of the spine and the right slope of the pelvis. Incorrect position and enlargement of pelvis slope is linked to the flabby tension of rectus abdominis muscles and shortening iliac-lubar thigh muscle.

Table 5. Evaluation of the abdomen and pelvis slope of female pupils ($n = 69$)

Girls/evaluation	Mark 1	Mark 2	Mark 3	Mark 4
$n = 69$	15,52 %	75,86 % **	7,76 %	0,86 %

Legend: ** $p < 0,01$

Physiological, natural curvature of the spine in a sagittal and lateral plane has its justification whether in terms of health, economic, and aesthetic. In the evaluation of IV.

area the back curves (Table 6) we have come to the conclusion, that the with mark 1 was evaluated 4,31 % of female pupils, while the highest percentage with significance (Chi = 7,989; $p < 0,01$) we have seen in the mark 2. 42,24 % ($p < 0,05$) of female pupils had visibly rounded back, which was accompanied by a sliding of the head forward as compensation.

Table 6. Evaluation of back curve of female pupils (n = 69)

Girls/evaluation	Mark 1	Mark 2	Mark 3	Mark 4
n = 69	4,31 %	53,45 % **	42,24 % *	0 %

Legend: ** $p < 0,01$; * $p < 0,05$

In the next evaluation of V. area, which is focused on posture in frontal plane (Table. 7) we found the highest percentage and significance in mark 3 (Chi = 7,551; $p < 0,01$) and the lowest in mark 4 (1,72 %).

We have noticed in these female pupils protruding scapula and shoulders, which were displaced to the front, what are according to Labudová & Vajciková (2009) typical symptoms of round back, as one of the normal weaknesses of the spine.

Table 7. Posture in frontal plane of female pupils (n = 69)

Girls/evaluation	Mark 1	Mark 2	Mark 3	Mark 4
n = 69	7,76 %	28,45 %	62,07 % **	1,72 %

Legend: ** $p < 0,01$

Initially it may be only about malfunctioning, which may in time grow into a structural failure. Therefore, it is important prior to the maturation of the spine (about till 12 to 13 years) align the spine with active muscle effort and thus also extend it. The main cause of the external expression of the winging scapula is flabby scapula muscles and rhombic muscles, which are overdrawn with relatively more powerful pectoral muscles (Bendíková & Stacho, 2010). In 7,76 % of female pupils we found the full symmetry, the same height of shoulders, which have been released, scapula was not winging, while 28,45 % had slight differentiation.

In the area of the lower limbs (Table 8) we found significantly in 69 % ($p < 0,01$) correct position of the lower limbs, where slight deviation we found in 22 %. Valgus and varus position of the lower limbs we found in 9 %, while the flat feet at 42 %.

Table 8. Evaluation of the lower limbs of female pupils (n = 69)

Girls/evaluation	Mark 1	Mark 2	Mark 3	Mark 4
n = 69	69 % **	22 %	9 %	0 %

Legend: ** $p < 0,01$

Rozkydal, Chaloupka (2001) add that graduated valgus and varus of the knees may be congenital or acquired, and may be affected by one or both legs. Slight symmetric valgus can be hereditary and often it can be fixed during the growth.

Conclusion

In the present study we evaluated the status of the postural system with the intention to posture as one of the main determinants of the quality of the postural system, which is an important indicator of developmental trends of child organism. It is the result of balanced activity of the nervous system and the musculo-skeletal system, postural regimen and rational nutrition. We assume that our findings are based on the primary prevention of incorrect posture creation, which consists in the sufficient volume of spontaneous but also controlled physical activities during their stay in the school but also in the leisure time of monitored group of female pupils.

The most problematic segments of the posture in our monitored group of female pupils were significantly ($p < 0,01$) area of the head, shoulders and scapula, which were reflected in the slightly enlarged chest kyphosis. Symptom of these disorders is back pain, which may later show in adulthood as a vertebral disorders of musculo-skeletal system, which are a often reason for visits to a doctor and sick leave.

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