

POSTURE DISORDERS AND THEIR CAUSES IN RURAL SCHOOLS PUPILS

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Abstract

The aim of the research is to identify the particularities of pupils' body posture in the rural schools of Šiauliai region. Particularities of pupils' body posture were screened using Adams forward bend test. It was found out that faulty body posture (lesion of skeleton-muscle system and asymmetry of innervations) is common to the largest part of different age pupils in rural schools. Faulty body posture of asymmetry of innervations has a tendency to normalize during child's development, and faulty body posture of lesion of skeleton-muscle system might change to serious pathology of bone system.

Keywords: *rural schools, school age children, disorders of body posture.*

Introduction

During the last decades a lot of investigations (Mickevičienė, Motiejūnaitė & Skurvydas, 2006; Dregval & Malinauskaitė, 2008) point that physical activity of school age children is insufficient. Low physical activity serves as a presumption of posture disorders. Comparing physical activity of pre-school children with school age ones, it is obvious, that it became lower (Meškaitė et al., 2012) and is closely connected with the appearance of posture disorders (Ustinavičienė, Škėmienė, & Papečkytė, 2009). Problem of abnormal posture among school children who are living in cities is discussed rather widely (Armonienė, 2007; Mickevičienė, Motiejūnaitė, & Skurvydas, 2006). Talking about the peculiarities of the posture of school age children who live in rural areas there is a lack of information, because it looks like children in rural areas are more physically active. Timely and qualified diagnosis and help still remain a relevant problem that concerns the whole health of growing society. The understanding of modern society orients parents, educators, physicians and other specialists that take care about children's health to the maintaining, preventing and developing health models that support healthy society (Global recommendations on physical activity for health, WHO, 2010).

Posture is a usual, individual body position in dynamic and static state. Right body posture is a usual posture matching biomechanical principles of the human body. It is determined by physiological curves that depend on the strength and weight of different body and muscles parts. Posture particularly is regulated by dorsum and abdomen muscles. Most often strain balance between neck and abdominal flexors and their antagonists – dorsum and neck extensors suffers. But even in the case of different reasons of tension disorders the differentiated help

and interventions could prevent serious health conditions. As the research of the Lithuanian scientists shows (Adaškevičienė, 2004; Ivaškienė & Meidus, 2007; Strukčinskienė, Kurlys, Griškoniš, & Raistenskis, 2011) abnormal body posture disorders are common for 25-30 percent of all school population. 6-8 percent out of this number have scoliosis. Research data shows that the number of body posture disorders is increasing and age of children to whom scoliosis is diagnosed becomes younger. In teenage period they start to be more obvious. Scoliosis is an unnatural curvature of the spine. The normal shape of the spine includes a top-of-the-shoulder curve and a lower back curve. If one's spine is curved from side to side or in an "S" or "C" shape, one probably has scoliosis (Johnson, n.d.). The largest category of scoliosis is idiopathic scoliosis, which has no definite cause. Idiopathic scoliosis is broken down by age group: infant (0 to 3 years); juvenile (4 to 10 years); adolescent (11 to 18 years); adult (18+ years) (Johnson (n.d.). Scoliosis. Scoliosis Research Society). There is a number of different types of scoliosis among the estimated 20 percent of cases in which a cause can be identified, including: congenital (spinal deformities that appear at birth) neurological (when brain abnormalities affect nerves and muscles in the spine).

Reasons of posture disorders could be different and have a lot of reasons. They could be as a result of lesion of bone muscle systems, insufficiency of CNS functioning, inappropriate environment, nutrition, lack of physical activity, etc. Daulenskienė (2003) points that often specialists face with primary (innervatory) and later forming secondary osteogenic disorders of posture (scoliosis and kyphosis). It is indicated that 75 percent of all cases of scoliosis have tendency for progression (Daulenskienė, 2003). Mentioned facts indicated the actuality of revealing posture disorders of school age children who live in rural areas, because pupils health care in rural areas is still problematic.

Object of the research: posture disorders and their causes of rural schools pupils

The aim of research: To reveal body posture peculiarities among school age children who live in rural area.

Objectives of the research:

1. To analyze specialized literature concerning reasons and forming mechanisms that determines disorders of body posture.
2. To accomplish research using standardized method of evaluation of gross motor development (Gross Motor Function Measure (GMFM) and general evaluation of neurological status.
3. To set disorders of body posture that is common to the pupils of rural area according to the age aspect.

Methods of the research:

Analysis of scientific literature; Adam's forward bend test, neurological evaluation of asymmetry rate between muscle tensions and muscles strength; research data was processed using SPSS and EXCEL programs.

Sample of the research: 1268 pupils of 1-12 forms from Šiauliai region rural schools took place in the research. The research was performed in February-June, 2015.

Ethics of research: Parents of pupils and heads of the institutions were informed about the research. During the meeting the goals and methods of the research were presented. Agreements between parents/caregivers and heads of institutions were signed. The gained data was coded so anonymity was kept. Final results of the research were presented in schools generalized.

Analysis of the research results

The research was done in 2 rural mainstream and 3 rural primary schools of Šiauliai region. All 1268 pupils were divided into 3 age groups (see fig. 1). Distribution into 3 age groups was purposeful because of different levels in psychomotor development. The first group (from 7 up to 11 years) matches maturity of psycho-physiological parameters of second childhood, second group (from 12 to 15 years) is a group of adolescence which is characterized as a period of puberty, and the third one is a group from 16 to 18 years of age that could be called as a youth, id est after period of puberty. The largest group consists of pupils of primary forms. The number of girls was larger and it matches the demographic situation in rural area.

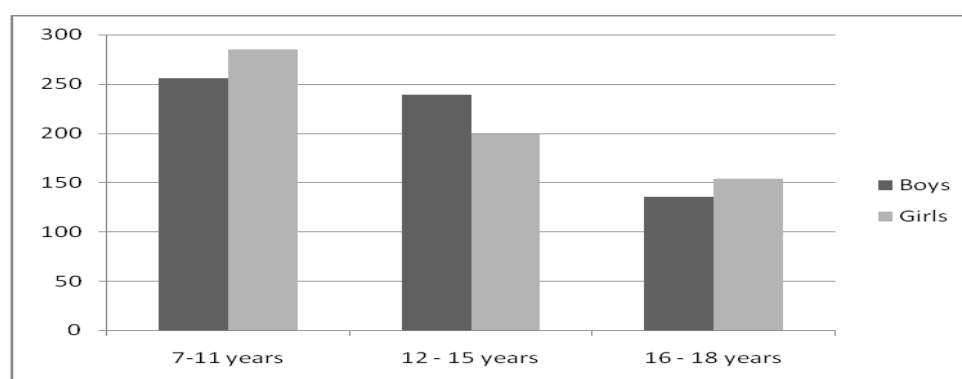


Figure 1. Participants of the research according to the age (frequency) (N=1268)

The research was organized testing pupils with traditional Adam's forward bend test. The purpose of the Adam's forward bend test is detecting structural or functional scoliosis. This test is most often used during school screening for scoliosis. It can also be used with patients who have a family history of scoliotic posture or with patients who have detectable scoliosis of uncertain etiology. The scoliosis is functional when the characteristics of scoliosis become more visible while the patient bends. With a structural scoliosis, the scoliotic deformity will remain the same as in the standing position. Data was supplemented by neurological observation and evaluation of pupil's motor development.

According to the Adam's forward bend test spinal asymmetry, shoulders and scapula level asymmetry, hips level heads line up with the pelvis or a rib humps were observed. As it was mentioned abnormal posture in 753 cases was detected. Mostly spinal asymmetry was observed but it could not be assessed as scoliosis. In 163 cases signs of scoliosis were rather obvious. For those participants to whom scoliosis was revealed (163 cases) asymmetry of shoulders and scapula levels, hips level and heads line up with the pelvis or rib hump correspond to the I or II scoliosis level (Coob angle $< 10^\circ$ to $>25^\circ$). So it means that even in one case several symptoms of impaired body posture due to scoliosis were observed.

From all the participants who took part in the research 40.2 percent (515 cases) have no disorders of body posture. For the rest minimal disorders of skeleton – muscles system or asymmetry of innervations was set. Disorders of body posture were most frequently identified in primary forms and assessing body posture of pupils from senior forms disorders were identified less frequently. These findings correspond with McIntosh, Weiss (2012) research results that points that the cause of adolescent idiopathic scoliosis (AIS) – curvature of the spine that measures greater than 10 degrees – is unknown. Although AIS affects both boys and

girls older than age 10, AIS is more than 10 times more common in girls than in boys, with an overall ratio of 11:1. This was proved by our research as well (Table 1).

Scoliosis, hyper-lordosis, kyphosis are named as forms of muscles, bones and joints impairments. Possible micro trauma of craniospinal area or inborn pathology of muscle system in the research is named as insufficiency of muscle innervations. Scoliosis, kyphosis and lordosis in our research are treated as the derivation of osteogenic pathology, however in the early periods of development it could be conditioned by asymmetry of innervations.

163 participants of the research to whom the posture disorders were revealed have signs of deformations of skeleton – muscle system: scoliosis, kyphosis and lordosis, as well as residual symptoms of rickets, congenital malformations.

Table 1. Type of body posture lesion according to the gender (frequency)

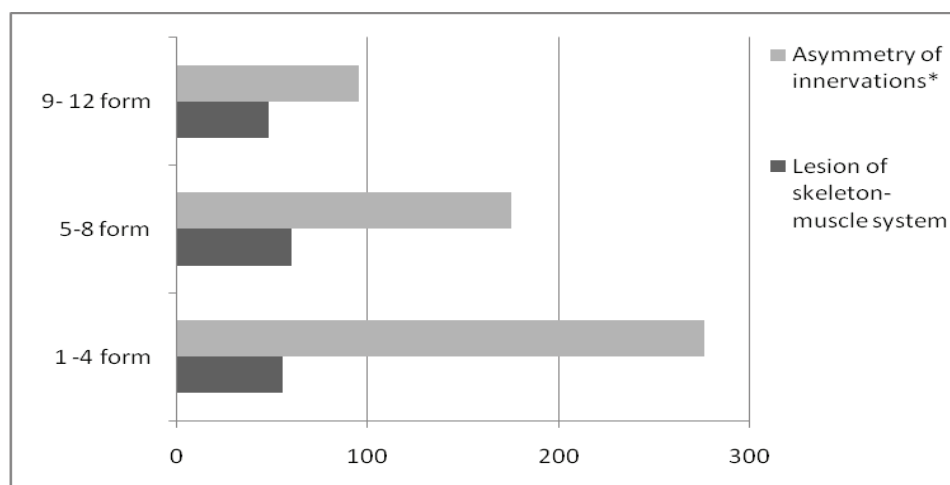
Age	Girls			Boys			Total
	Lesion of skeleton-muscle system	Asymmetry of innervations	No signs of abnormal body posture	Lesion of skeleton-muscle system***	Asymmetry of innervations	No signs of abnormal body posture	
7–11 years	29 (2.28%)	145* (11.43%)	60 (4.73%)	26 (2.05%)	131 (10.33%)	59 (4.65%)	450
12–15 years	33 (2.6%)	91 (7.17%)	65 (5.12%)	27 (2.12%)	84 (6.62%)	89 (7.01%)	389
16–18 years	26 (2.05%)	73 (5.75%)	117 (9.22%)	22** (1.73%)	66 (5.20%)	125 (9.85)	429
Total	88 (6.94%)	309 (24.36%)	242 (19.08%)	75 (5.91%)	281 (22.16%)	273 (21.52%)	1268

Note: *statistical significance - $p=0,04$; **statistical significance - $p=0,05$; ***statistical significance - $p=0,02$

Analyzing the research data according to the age it was set that body posture disorders are mostly common for girls (Table 1). This fact is observed in all groups of the respondents but statistically significant differences ($p=0.03$) were revealed in the first group (7 to 11 years of age) comparing with other groups. These findings correspond with McIntosh & Weiss (2012) research results that point that the cause of adolescent idiopathic scoliosis (AIS) – curvature of the spine that measures greater than 10 degrees – is unknown. And disorders of such kind are more prevalent, progressive in girls. Although scoliosis affects both boys and girls older than age 10, it is more than 10 times more common in girls than in boys, with an overall ratio of 11:1.

It was set that body posture of younger pupils is more impaired than of the ones from higher forms ($p=0.03$), (fig. 2). And posture impairments of the girls were mentioned more often than in boys.

Prevailing number of posture disorders was set in 1-4 forms (0.05) (see table 2). It could be associated with rapid grow of muscles and skeleton systems, insufficient physical activity, day regime. These propositions are discussed in the works of Strukčinskienė & Raistenskis (2012) as well.



Note: *statistical significance - p=0.05

Figure 2. Reasons of posture disorders (frequency), (N=709)

These ideas could be proved analysing the prevalence of posture disorders in the higher forms where this number is decreasing. More stable processes of growth, strengthened system of muscles affect the pupils' body posture. Mostly all 9-12 form pupils (242 respondents) are active in sport activities and expedient physical load supports correct forming of body posture.

The reasons of posture disorders of 528 pupils are impairments of muscle innervations (Table 2) – weak muscles of shoulder strap (p=0.02), intercostals, long back muscles, diagonal abdominal muscles (p=0.04). Low muscle tension is appropriate for the significant part of the respondents and this fact could be assessed as a factor for future forming of posture disorders. Low muscle tension could be the reason of innervations impairments due to which asymmetry of posture is forming (lower shoulder, scapula, and pelvis bones asymmetry). Pupil experiences pain and feels discomfort in the spine area, limited movements appear. It was set that 58 percent of the respondents after intensive physical load feel pain in spine and waist areas.

Table 2. Reasons of posture disorders due to the insufficient muscle innervations (frequency)

Area of impairment	N	SD	p
Shoulder muscles	274	0,89	0,02
Intercostals muscle	101	0,65	-
Long back muscles	145	0,75	0,04
Diagonal abdominal muscles	75	0,64	-

The most problematic are shoulder muscles (p=0.02) and posture disorders conditioned by their weakness. It could be due to the lack of physical activities, heavy backpacks, elongated sitting during leisure or home work time. This point of view proves the research done by Vaitkevičius, Bakanovienė, & Miliūnienė (2005). Being in the same position for a long time long back muscles became weak (p=0.04) as well. This combination works as a tandem forming postures disorders. So taking into the mind that physical culture in schools is a compulsory subject teachers might pay more attention to planning of lessons that support strengthening shoulder and long back muscles.

Discussion

Analysis of the results proves that more than a half (50,3 percent) of pupils who live in rural areas have posture disorders. A few groups of reasons of posture disorders were set up: 1) asymmetry of innervations and impairments of muscle tension; 2) impairments due to the osteogenic derivations; and prevailing was the first reason of posture disorders. Such kind of disorders was common to the pupils of primary forms. These findings correspond to the research results of Daulenskienė (2003); Boström, Dellve, Thomée, & Hagberg (2008), in which the authors point that posture disorders that are fixed in the younger school age later have a tendency of diminishing. The asymmetry of innervations prevails more in the upper trunk, id est in shoulder muscles and neck muscles. This could be associated with micro trauma in craniospinal area or it could be associated with insufficient maturity of foetus. But to prove these ideas more detailed investigations must be done. More complicated posture disorders often turn to other vertebrogenic deformations. That is why posture disorders due to the impairments of innervations and asymmetry of muscle tension could be assessed as a dynamic phenomenon. Timely and specialized intervention together with proper organization of physical education could give positive results. This idea is based on the research results concerning the number of posture disorders in the higher forms of rural schools. In higher forms this number becomes much lower. However in the higher forms the posture disorders form a largest group of all the respondents taken together. It means that delayed correction of posture disorders progresses to the more complicated and severe impairments.

Conclusions

1. Reasons of posture disorders could be different and there can be a lot of reasons. They could be as a result of lesion of bone muscle systems, insufficiency of CNS functioning, inappropriate environment, nutrition, lack of physical activity.
2. Analysis of the results proves that more than a half (50.3 percent) of pupils who live in rural areas have posture disorders.
3. It was set that body posture of younger pupils is more impaired than of the ones from higher forms ($p=0.03$). And posture impairments of the girls were mentioned more often than in boys.
4. Posture disorders that are fixed in the younger school age later have a tendency of diminishing. The asymmetry of innervations prevails more in the upper trunk, id est in shoulder muscles and neck muscles.

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POSTURE DISORDERS AND THEIR CAUSES OF RURAL SCHOOLS PUPILS

Summary

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Many authors mentioned that faulty body posture is one of the most prevalent disorders of children bones – muscles system. The proportion of muscles strain (flexors of neck, abdomen area and their antagonists in dorsum neck area) suffers in the forming of fault body posture. The disturbances of body posture might be avoided providing specialized help against the odds of different reasons of muscles tension disorders. The **aim of the research** is to identify the particularities of pupils' body posture in the rural schools of Šiauliai region. **Object** of the research: posture disorders and their causes of rural schools pupils

It was set up that faulty body posture (lesion of skeleton-muscle system and asymmetry of innervations) is common to the largest part of various age pupils in rural schools. Body posture fault among girls differs significantly in comparison with boys. Analyzing the results according to pupils' age it was found out that in all age groups neurogenic – muscles derivation prevail over the osteogenic reasons of faulty body posture.

Analysis of the results proves that more than a half (50.3 percent) of pupils who live in rural areas have posture disorders. In the research the biggest part of the respondents consists of primary school girls and the smallest part of boys from higher forms. This distribution reflects the demographic structure of pupils who live in rural areas of Šiauliai region. Many youth attended rural schools until 10th form and later they are continuing studies in the centers of vocational training that are in the largest cities. That is why small number of participants do not reveal whole characteristics of discussed age period and the research must be expanded into the wider geographic areas. The aim of the research was to reveal body posture peculiarities among school age pupils that live in rural area. Methods of the

research: analysis of scientific literature; general neurological evaluation of pupil, revealing asymmetry rate between muscle tensions and muscles strength; assessment of gross motor development (Motor Skills Inventory, 1992); research data was processed using SPSS and EXCEL programs. Participants of the research: 1267 pupils of 1-12 forms from Šiauliai region rural schools took place in the research. Research was performed in February-June, 2015. Analysis of specialized literature reveals that reasons of posture disorders could be different and there can be a lot of reasons. They could be as a result of lesion of bone muscle systems, insufficiency of CNS functioning, inappropriate environment, nutrition, lack of physical activity.

It was found out that faulty body posture (lesion of skeleton-muscle system and asymmetry of innervations) is common to the largest part of various age pupils in rural schools. It was set that body posture of younger pupils is more impaired than of the ones from higher forms ($p=0.03$). And posture impairments of the girls were mentioned more often than in boys. Posture disorders that are fixed in the younger school age later have a tendency of diminishing. The asymmetry of innervations prevails more in the upper trunk, id est in shoulder muscles and neck muscles. Faulty body posture of neurogenic derivation has a tendency to normalize during child's development, and faulty body posture of lesion of skeleton-muscle system might change to serious pathology of bone system. Reasons of neurogenic derivation are prevailing among others reasons that cause faulty body posture and it might be adjusted by preventive measures. Faulty body posture of vertebrogenic derivation needs more specialized help.