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Level of Students' Posture in Adolescence in Relation to Physical Activity

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Abstract

The aim of the partial task of the research has focused on the level of the students' posture in the adolescence in relation to the physical activity, as well as the relationship between the mentioned factors. The monitored group consisted of 186 high school students of Žilina region, of which were 92 boys and 94 girls who were the students of the 3rd and 4th grades. The partial part of the research was realized in three consecutive stages in October and November of the school year 2017/2018. The mean age of the boys was 17.9±0.9 years old and the girls was 18.2±1.3 years old. From the point of view of the data acquisition methods, we used the standardized method of the evaluation of the posture, common for the physical education practice. From the point of view of the information acquisition about the physical activity, we used the interrogative method, the questionnaire. The results provide the primary information about the state of the muscular and skeletal system of the students in the adolescence with the intention to the posture. The incorrect posture was found in girls ($\chi 2 = 7.119$), as well as in boys ($\chi 2 = 6.926$), which was marked by the III. qualitative degree of the posture evaluation. What is more, the highest incidence of the kyphotic posture was proven in boys (32 %, $\chi 2 = 7.311$; $p < 0.01$), while the scoliotic posture was proven in girls (38 %, $\chi 2 = 6.982$; $p < 0.01$) with the significant difference. The results, at the same time, significantly ($p < 0.01$) point to the receptive way of the leisure time for the high school students. The partial monitoring of the research shows the relationship between the monitored factors in girls ($r = 8.993$), as well as in boys ($r = 7.321$). *This article is a part of the grant task: VEGA No. 1/0242/17 Physical activity as prevention of functional disorders related to the musculoskeletal system of secondary school students.*

Keywords: posture, physical activity, pupil.

1. Introduction

Civilization diseases, specifically an obesity and an especially associated inactivity, a sedentary lifestyle, deformations, as well as functional and structural disorders in relation to a correct posture have become serious public health problems of a present time, not excluding Slovakia (Kanásová, 2004; Kratěnová et al., 2005; Salminen et al., 2007; Majerík, 2009; Bendíková, Stacho, 2010; Adamčák, et al., 2011; Kanásová, Šimončičová, 2011; Farioli et al., 2014; Azabagic et al., 2016; Bendíková, 2016; Ludwig et al., 2016; Noll et al., 2016), in which more than three quarters of patients complained about a pain in a spine (Jonsson et al., 1999; Mackenzie et al., 2003), while in Europe a prevalence was up to 22 % (Eurobarometer, 2007). The pain in

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children, at least 1 time in life, was recorded in 46 % – 53 %, while the persistent pain was up to 15 %. Similarly, the situation has worsened in Slovakia and other countries, as for example the situation from 1996 to 2008 had tripled.

Health insurance statistics have showed that the situation of a muscular and a skeletal system has been a social and an economic problem, not only in the Member States of the European Union, but also in the United States of America, where roughly one seventh of patients may receive an adequate health care, as every year $ 250 billion have been invested into the health care (Stellman, 1998; Mathers, Penm, 1999; DeFranco et al., 2009). Similarly, in Australia, total expenditure, in 1993/1994 climbed up to $ 3002 million and in the Nordic countries (Denmark, Sweden, Norway, Finland and Iceland) was estimated to 2.7 % – 5.2 % of gross domestic product, which was invested in a treatment of the muscular and skeletal system.

An external manifestation of the functional disorders in the area of the muscular and skeletal system is the posture, which results in a certain shape and a function of the spine. It is an accompanying sign of every activity, as well as it is itself an act, a physical habit that can be managed by owns' will (Čermák et al., 2005).

The correct posture is defined more economically than aesthetically, as according to Buran (2002) represents a vector's optimally centered knee position with minimal demands on a muscular activity of the posture. Kolář et al. (2009) view the posture as a sign of a human being or a particular way of realizing a postural stereotype, while Bendíková (2011) mentions that the posture is the position of individual segments in a time and a space, which is the external manifestation of the muscular system. The opposite of the correct posture is an incorrect posture, which has its features manifested in typical functional disorders of the posture (Čermák et al., 2005). Labudová, Vajcziková (2009) perceive the posture as a violation of the habit of the correct posture, in which are presented various variations of a temporary nature (if they are of a permanent nature, they are deformations in the area of the structure of the spine, joints, muscles and ligaments), which interfere an optimal vertical axis of a body. The incorrect posture cannot be compensated by the so-called a spontaneous movement, therefore the posture left only on a natural development is very unreliable.

Nowadays, we have experienced a decline of an interest in the physical activity, realized within, whether organized or not organized forms, not only in primary school pupils, but in high school students as well. In this context, a phenomenon has appeared in a school physical and sport education in Slovakia, which has had an ascending trend. They are known as not taking exercise students, mainly the girls. A lack of the physical activity (of gym character) in the students' physical regime is manifested, not only in their health, but also in their physical ability, performance and physical literacy (Müller et. al., 2008, 2015; Labudová et al., 2009, 2010; Čechovská, Dobrý, 2010; Dobay, 2007; Ihász, Rikk, 2007; Chovanová, Majherová, 2011; Labudová et al., 2012; Szőköl, 2015, 2016), by which are created disproportions within the physical development. Labudová (2003) states that the primary schools have been attended by 4 % – 6 % of the pupils with the health disorders, while the secondary schools have been attended by more than a half of the students (13 %). After several years Slezák (2004), Šimonek et al. (2005) report a number of the not taking exercise boys is ranging from 27.7 % to 39.6 %, while the number of the not taking exercise girls is ranging from 38.2 % to 48.1 %. It follows that the number of the students who are freed from the physical activity within the physical and sport education, due to the various diseases and disorders of the health are of an ascendant nature. The practice points to the fact that this state is associated with multiple subjective and objective factors.

The aim of the research was to find out the current state of the muscular and skeletal system with the intention to the posture and physical activity of the secondary school students, as well as the relationship between the mentioned factors, in order to spread the knowledge from the mentioned area.

2. Methodology

The monitored group consisted of 186 high school students of Žilina region, of which were 92 boys and 94 girls who were the students of the 3rd and 4th grades. The mean age of the boys was 17.9±0.9 years old and the girls was 18.2±1.3 years old. More detailed characteristics of the monitored group is presented in the Table 1.

The partial part of the research was realized in three consecutive stages in October and November of the school year 2017/2018, where an anonymity of respondents was preserved. In order to obtain the data of the physical activity, we used the interrogative method – the questionnaire entitled "Physical Regime and Health", which was based on the research needs, several authors and national reports of the nationwide researches.

Table 1. Characteristics of the monitored group (n = 186)

Mean values (x)	**Boys (n = 92)**	**Girls (n = 94)**
Age (years old)	17.9±0.9 years old	18.2±1.3 years old
Body height (TV/cm)	177.8±6.6 cm	165.65±5.5cm
Body weight (TH/kg)	75.2±6.3 kg	58.3±6.6 kg
BMI (Body Mass Index)	23.61±2.9	21.33±2.6

The evaluation of the posture was performed by using the standardized method of the physical education practice, known as Klein and Thomas modified by Mayer (Bendíková, 2011), which is associated with the visual evaluation of the posture, which is divided into four qualitative levels, while is represented by the following marks, respectively degrees (1- 4), where:

A. Correct posture – without deviations from the standard,
B. Good posture – with small deviations from the standard,
C. Wrong posture – with bigger deviations from the standard,
D. Incorrect posture – with severe deviations from the standard.

To evaluate the qualitative degrees of the posture, we used the Chi-squared test ($\chi 2$, $p < 0.05$). Similarly, for the evaluation of the significance of the difference of the questionnaire answers we used the Chi-squared test ($\chi 2$, $p < 0.05$). The support was the percentage frequency analysis (%) and arithmetic mean (x±). The Pearson's correlation coefficient (r) was used to evaluate the relationship between selected monitored factors. We also used the methods of the logical analysis and synthesis, using the inductive and deductive techniques, comparisons and generalizations. All data were processed differentially by gender of the respondents in the tables.

3. Results

Starting from the partial aim and tasks, we present the part of the results that are subject to further more accurate monitoring and processing. The presented results cannot be generalized, but it is necessary to understand them in the overall context, as an orientation and starting in organizing the leisure time of the secondary school students in relation to their health.

Only 15 % of the girls of the monitored group had the correct posture, 30 % had the good posture and 55 % had the wrong posture. In boys, we found the wrong posture in 39 %, while the good posture was in 42 % and the correct posture was in 19 %. Not even in girls or boys, the incorrect posture was not found, which was positive evaluated, in terms of the health. The significant difference ($\chi 2 = 6.009$, $p < 0.05$) among the both genders was recorded in the III. qualitative degree of the posture (Table 2).

Table 2. The evaluation of the posture in students (n = 186)

Level of posture / Points	**5 points**	**6-10 points**	**11-15 points**	**16-20 points**
I. Correct posture	G 15 % B 19 %	-	-	-
II. Good posture	-	G 30 % B 42 %	-	-
III. Wrong posture	-	-	G 55 %* B 39 %	-
IV. Incorrect posture	-	-	G 0 % B 0 %	-

In the area of the *I. evaluation of the head and neck* was rated 17 % of the girls and 2 % more boys (19 %), whose view lead forward, lower part of a jawbone was pushed. The view forward, however an axis of the neck was slightly inclined forward about 10 degrees, which was manifested in 35 % of the girls and 36 % of the boys. The highest percentage representation was found in both boys (48 %) and girls (45 %) by the degree 3.

In the area of the *II. evaluation of the chest* we had the normal chest that was symmetrical, its axis was vertical, as well as was well arched. Ribs contained with the spine 30 degree angle, were symmetrical while breathing, kyphosis was physiological in 29 % of the girls and 19 % of the boys. The small deviations from the standard during the axis of the chest, inclination about 10 degrees were found in 48 % of the girls and in 59 % of the boys. With the 11 % difference in favor of the girls and mentioned percentages, we found in boys (22 %), as well as in girls (33 %), which was rated by the degree 3, characterized by the flat chest and spine, as was considerably bent, a plummet was triggered from a nape of the neck and the plummet attached to the kyphosis lead out of the head. The severe deviations of the chest shape, which was flat and spine was strongly bent in a full arc were not detected.

In the area of the *III. evaluation of the abdomen and inclination of the pelvis*, we found in girls that by the grade 1 was rated 19 %, 2 – 24 % and 3 – 54 % ($\chi 2 = 8.696$; $p < 0.01$). In boys by the grade 1 was rated 21 %, 2 - 39 % and 4 - 40 %. We did not find the state at the level of the grade 4 in girls or boys.

In the area of the *IV. evaluation of the spine curve*, we found in girls with the grade 1 17 % and in boys 28%. The small deviations from the standard, in terms of plus or minus were found in 37 % of the girls and 35 % of the boys. Clearly rounded and flat spine was found in 35 % of the boys and 48 % of the. The severe deviations from the standard were not found in the monitored group.

In the area of the *V. evaluation of the posture in the frontal plane*, a full symmetry, an equal height of shoulders, relaxed shoulders, shoulders do not stay, their inner axes were parallel were in 17 % of the girls and 21 % of the boys. The small deviations of the standard were found in girls (30 %) and boys (34 %). A sliding of one side, a non-asymmetry of a figure, one shoulder was above were in 53 % of the girls and 45 % of the boys. The considerable removal of blades, non-asymmetry of discontinuity of thoracic diaphragm were not been recorded in our group.

We found, in relation to the posture that the boys had the highest incidence of the kyphotic posture (32 %), while the girls had the scoliotic posture (38 %). Both of these findings were significant ($\chi 2 = 7.311$, $p < 0.01$) and ($\chi 2 = 6.982$, $p < 0.01$). Other functional disorders found in boys were the scoliotic posture (27 %), hyperlordotic posture (19 %) and hypolordotic posture (3 %). In girls, with the lowest percentage representation was also the hypolordotic posture, then hyperlordotic posture (15 %) and kyphotic posture (28 %).

The physical activity is necessary for our health, but it must be adequate and regular. That is why we were interested in the following facts.

The leisure time of the boys is spent mostly by the physical activities, while the girls preferred meeting with their friends. 32.5 % of the boys preferred the sport activities ($\chi 2 = 7.332$, $p < 0.01$). The second most popular activity was playing computer games, which was marked by up to 30.2 % of the boys. In 31.1 % of the girls ($\chi 2 = 7.001$, $p < 0.01$), there was meeting with friends. Only 28 % of the girls rated the movement, so it was their second most popular activity in their leisure time. Only 6.3 % of the boys marked the possibility of others, specifically mentioning activities such as a work, a music, a piano, a learning, a reading or a relaxing. The girls marked the option "other" in 7.3 %. In their answers were predominant mainly the reading, including a painting, the piano, a playing with a dog and the learning.

Regardless of the answer of the first question, whether the students preferred watching television or active physical activity, we asked how many minutes a day they spend using a computer or a television. More than half of the boys, namely 57.5 % used the computer or television for 2 - 3 hours a day ($\chi 2 = 13.642$, $p < 0.01$), a quarter of the boys, 25.3 % rated 1 hour a day. The girls did not meet with such a visible difference. Although, their response 2 - 3 hours a day was up to 43.2 % ($\chi 2 = 11.419$, $p < 0.01$). Another 40.7 %, which was almost the same proportion of the girls rated 1 hour a day.

Since a schedule of the high school students usually differs, according to whether they had a regular school day when a majority spent most of the day at school, respectively preparing for the learning or it was a weekend, respectively holidays. That was why we were interested in whether

sport activities depended on this. So we asked if they had more movement during the weekend than school days, holidays or it did not matter. Up to 39.1 % of the boys ($\chi 2 = 8.112$, $p < 0.01$) said that most movement was going during the holidays. This fact was also reported by 39.8 % of the girls ($\chi 2 = 8.979$, $p < 0.01$). 29.9 % of the boys and 24.6 % of the girls said it did not matter whether they had the holidays or weekend, but that they moved almost the same way in most of their time.

In boys, surprisingly the first place ended with a walking, which was marked by 17.6 % of the boys ($\chi 2 = 5.987$, $p < 0.05$). Somewhat less boys, namely 17.1 % rated a football and 12.3 % a strengthening. In girls, as well as boys, the most commonly performed activity was the walking ($\chi 2 = 6.144$, $p < 0.05$). This option was reported by 19.6 % of the girls, another 10.7 % marked a skating and 10.4 % marked a cycling.

The students completed their answers by specifying the frequency, which was how often they performed the activity. 33.3 % of the boys said they performed the sport activity 2 - 3 time a week, another 31.0 % performed it 4 – 6 times a week and 27.6 % each day. The girls stated 43.2 % ($p < 0.01$) as they performed it 2 – 3 times a week, another 31.4 % each day and 12.7 % 4 - 6 times a week. Instead, they specified the answers by saying how many minutes they performed the physical activities. It was shown that most of the respondents spent 30 – 60 minutes a day by doing the sport activities, specifically 45.8 % of the boys and 39.8 % of the girls ($p < 0.01$). Our findings indicated the relationship between the monitored factors (the posture and physical activity), as in girls ($r = 8.993$), as well as in boys ($r = 7.321$).

We were also interested in the students' own view of, whether they were thinking enough about the physical activities time they were doing. 57.5 % ($p < 0.01$) of the boys thought that they devoed enough time to the movement, 31.0 % believed that they dedicated less than they should. Equally, 5.7 %, which was 5 boys said that they were dedicated to the movement more that it was needed and another 5 thought the opposite, as they dedicated to the movement a lack of time. In the girls 55.9 % ($p < 0.01$) reported that they spen less time than they should. The sufficient time was marked by 33.1 %. 8.5 % of the girls were admitted to the lack of time. The answer "more than necessary" was marked by only 3 girls, which was 2.5 %.

We were surprised by the response of the students when more than half of the boys, namely 55.3 % ($\chi 2 = 12.963$, $p < 0.01$) and more than half of the girls 52.7 % ($\chi 2 = 11.329$, $p < 0.01$) answered "because I love the movement".

We also valued positively the fact that the students were aware of the impact of the movement on their health, as up to 33.0 % of the boys and 39.7 % of the girls marked the answer "for the health". The option "other" was marked by 11.7 % of the boys and 7.6 % by the girls. The boys in their answers gave reasons such as: "it was for me relaxing, relieving the stress, I am with my friends, to look good in the summer, I like to improve and I like the success". The answers of the girls were: "Because of the character, it was the necessity, because I had to go with the dog, it was for me relaxing and fun.

Among the most common reasons for the non-sporting, non-exercise of the various forms of the leisure activities, the students responded that they simply did not want it, they did not have enough time or were causing the health problems. These findings and many reasons, according to the current upward trend of the various health disorders were perceived as irresponsible for their health.

4. Conclusion

The realization of the leisure time was different between the boys and girls, the boys preferred the movement, while the girls were meeting with the friends. Up to 57.5 % of the boys and 43.2 % of the girls were using the computer or television 2 – 3 hours a day. Favorite sport activities of the boys included soccer and in girls it was the skating. The boys felt that they had the sufficient time ($p < 0.01$), in terms of the volume of the sport activities, while the girls were less aware of it ($p < 0.01$). Despite the theoretical popularity of the movement in both sexes, we state that in their lifestyle the receptivity prevails over the activity is necessary for the human health.

The level of the posture and evaluation of the individual segments statistically confirmed that only 15.0 % of the girls and 19.0 % of the boys during the period had not disorders of the posture, while functional disorders of the posture appeared in 55.0 % of the girls and 39.0 % of the boys. From the point of view of the type of the disorders, we found that boys had the highest incidence of the kyphotic posture (32.0 %), while the girls had the scoliotic posture (38.0 %).

The above findings point to the phenomenon associated with the physical inactivity, respectively the sedentary way in the lives of the children and youth, not to mention the period of the adolescence, when it is necessary to monitor the level of the posture of the individual developmental periods and subsequently to shape and influence the physical habits, where the physical activity, namely regular is the basis of the healthy lifestyle and health prevention.

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