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The influence of four-month exercises during lessons on body posture in children in younger school age

Wpływ czteromiesięcznych ćwiczeń śródlekcyjnych na postawę ciała u dzieci w młodszym wieku szkolnym

KamilaKot, MirosławKokosz, Krystyna Stencel-Gabriel

Academy of Physical Education, Katowice, Poland
School of Health Sciences in Katowice,MedicalUniversity of Silesia, Katowice, Poland

Adres do korespondencji:
Kamila Kot
ul. Orzeszkowej 16c/14
41-253 Czeladź
adres e-mail: kot.kamila@gmail.com
tel. kom.: 500060333

The aim of the study was to check the impact of the school environment on the child's body posture and assessment of the influence of four-month physical exercises on school children's lessons on the results of measurements of spine mobility, physiological spinal curvature and attitude of the body.
Material and methods: the study group consisted of 23 children (including 10 boys), a control group of 15 children (including 10 boys), pupils of the 1st and 2nd grade Sports Primary School in Sosnowiec. The body posture was assessed 2 times at a 4-month interval in both groups (test and control). Spine mobility was examined by a finger-floor test and left and right using a centimeter, the physiological curvature of the spine was examined at the top of the sacrum using a goniometer, shoulder settings and thoracic kyphosis were examined by the Kasperczyk method.

Conclusion: The conducted observational study indicates a positive clinical effect of the, introduced during, lesson exercises with children in order to promote the correct posture.

Key words:
body posture; posture defects; range of spinal mobility; physiological curvature measurement; Kasperczyk method

Introduction

At every level of the children's psychomotor development, many factors have influence on the posture. During early childhood, forced immobilization in school benches may be influenced by the development of an incorrect posture. The daily wearing of heavy satchels (often incorrectly in one hand) is another element that has an adverse effect on the children's posture.

In the fact not only at school children have the wrong positions of the body, because this situation has place while doing homework or playing on a computer. Every day, the child is limited by movement by changing the lifestyle of the family and the homely atmosphere of continuous use by adults of television, video and computers [15]. Studies show that the community is unaware of the negative health effects of abnormal posture in children, and shows the lack of habit of paying children attention to the adoption of the correct position of the body in everyday life

The correct body posture is one that ensures body stability with minimal muscle work. This creates favorable conditions for the proper functioning of internal organs. The correct posture is a kind of a normal, free way to hold the posture of the body, which is consistent with the developmental dynamics of the child in a given period of his or her individual development [10].

Faulty postures are divided into congenital and acquired, which may arise as a result of a disturbed habit for maintaining a correct posture (habitual defects) [6]. Postural defects can be understood as a deviation from the accepted norms for the correct posture. These are fixed changes in the musculoskeletal system, often referred to as "holding on" errors. Defects of the spine in the sagittal plane are: round back (enlargement of the thoracic kyphosis and backbone of the spine), concave back (deepening of lumbar lordosis), round-concave back (combination

of round and concave backs), flat back (flattening of physiological curvatures of the spine). It is believed that flat back is the first symptom of developing scoliosis [10], which is considered to be a multispecies defect of the spine [12,9]. Among the defects of the lower limbs among children, the most frequent are valgus or deformity of the knees and flat feet.

Assumptions and purpose

In the early school period, prevention of postural defects is very important.

The aim of the study was to check the impact of the school environment on the child's body posture. In connection with this, the following research questions were posed:

1. Do during the lesson exercises improve the scope of the spine's mobility?
2. Do during the lesson exercises change the shape of the physiological curvature of the spine?
3. Do during the lesson exercises improve posture?

Material and methods

Material: 23 healthy children (including 10 boys) were students of the first-class Sports School in Sosnowiec. 15 children (including 10 boys) who were second grade students, were qualified to the control group, as in a given school year, there was not opened parallel first-graders class. The first examinations took place from 10 to 14 February 2014, the second study from 16 to 20 June 2014 obtaining the consent from the School Director to conduct the study and the parents' consent for the participation of their children in the observational study.

Method: This study was prospective and involved the introduction of during the lesson exercises with elements of postural correction for 4 months. The children exercised during the lesson, three times a day for 5-7 minutes. These were sets of breathing exercises, elongation of the spine, strengthening muscles and marches. In addition, corrective exercises were conducted in physical education classes in the form of movement games and games with elements of competition. However, two A3 format boards were hung on the school board with the inscriptions "Sit up straight" and "Stand straight". The task of the teacher during the lesson was to admonish and correct the position of the body in children. posture was assessed twice every 4 months for each child. Both in the test and control group (1st and 2nd tests). Each child's spine mobility was assessed by using the fingers-floor test and right torsion of the torso

using the centimeter tape, the physiological curvature of the spine at the top of the sacrum using a goniometer and the assessment of shoulder position and thoracic kyphosis using the Kasperczyk method [6].

Results

The results of the research were entered into the questionnaire, coded in Excel 2007 spreadsheets and analyzed using the Statistica computer program. 7.0 by calculating average values and standard deviation. Using non-parametric U Mann-Whitney and Wilcoxon tests, differences between and within the group were checked. The value of $p < 0.05$ was assumed as the level of statistical significance.

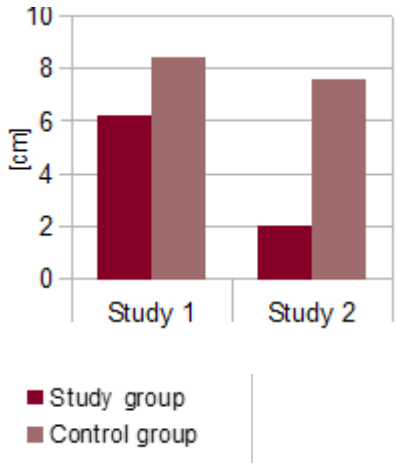

Fig. 1: Results of the fingers-floor test recorded in the test and control group in the first and second test

The spine mobility study using the fingers-to-floor test (Fig. 1) in the 9th preliminary study did not show a difference between the test and control groups, but a statistically significant difference ($p < 0.03$) was found in the second study, i.e. after four months demonstrating difference in measurements between the test and control groups of 5.6 cm. The analysis of intra-group results showed that the average value for the study group was 2 cm (+/- 4.96), and for the control group it was 7.6 cm (+/- 8.24). For the study group, the range of spinal mobility, during the fingers-to-floor test, after the exercises used, increased by 4.26 cm (this difference was statistically significant $p < 0.006$).

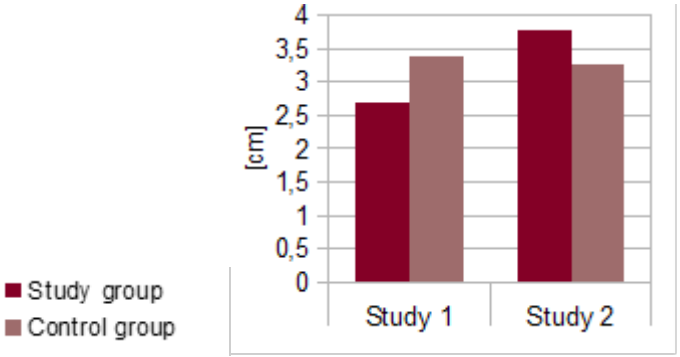

Fig. 2: Measurements of torsion of the torso in the left side recorded in the test and control group in the first and second tests

The evaluation of the left torso torsion results (Fig. 2) did not show significant measurement changes in the first study between the test and control groups. In the second study (after 4 months), the average value for the left twist test group was 23.39 cm (+/- 4.25), and for the control group 28.53 cm (+/- 5.78). The difference in measurements was 5.14 cm ($p < 0.004$). An intergroup comparative analysis showed that the average left torso for the research group was 23.39 cm (+/- 4.25), and for the control group 28.53 cm (+/- 5.78). For the research group, the range of spinal mobility, during the left torso of the torso, after the exercises used, slightly increased 1.61 cm ($p > 0.05$), and for the control group between the first and second study decreased by 1.93 cm ($p < 0.009$);

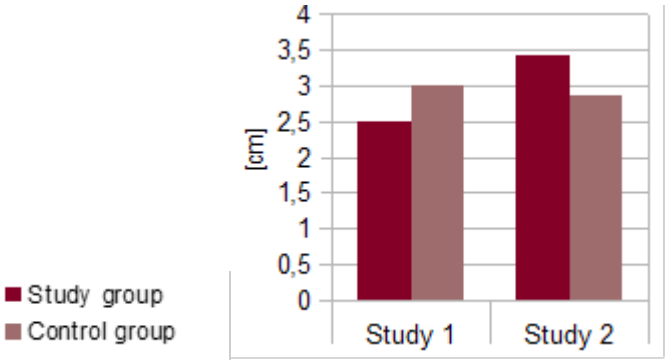

Fig. 3: Measurement results of torsion of the torso towards the right recorded in the research and control group in the first and second tests

Assessing torso right turn (fig. 3) in the first study it was found that the average torso turn to the right in the research group was 24.69 cm (+/- 5.16), and in the control group 26.6 cm (+/- 6 , 06) ($p > 0.05$) In the second study (after 4 months) the average value for the study group was 22.96 cm (+/- 5.28), and for the control group 28.47 cm (+/- 5.65)). The difference was

5.51cm (p <0.008). The intergroup comparative analysis showed that for the research group, the extent of spinal mobility, during the trunk slope to the right, after the exercises used, increased by 1.73 cm (p> 0.05) and for the control group by 1.87 cm (p> 0, 05)

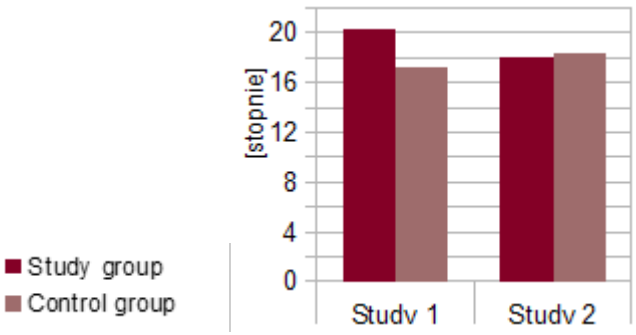

Fig. 4: Results of the measurement of physiological curvatures of the spine at the top of the sacrum, recorded in the research and control group in the first and second study

The first intergroup study of the spine curvatures at the top of the sacrum (Fig. 4) showed for the study group average values of 20.39o (+/- 7.38), and for the control group 17,4o (+/- 5.48), the difference was not statistically significant (p> 0.05). In the second study, the average value for the research group was 18.04o (+/- 3.75), and for the control group 18.4o (+/- 5.35) and similarly the difference in the obtained results of 0.39 was not statistically significant. Intra-group results showed that for the research group, the physiological curvature of the spine at the top of the sacrum was reduced by 2.35o (p <0.04) after the exercises, while the control group increased by 1.13o (p>0,05).

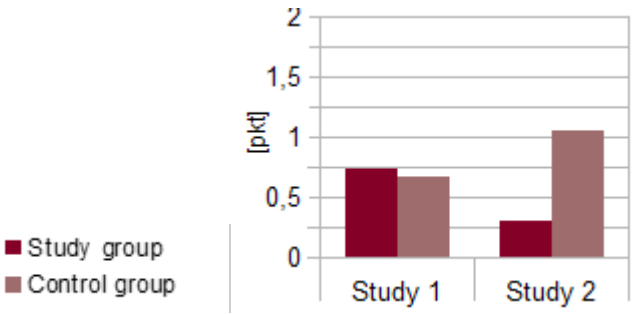

Fig. 5: Results of shoulder position assessment using the Kasperczyk method, noted in the research and control group in the first and second study

In the first intergroup study of shoulder position (Fig. 5) it was shown that the average value for the study group was 0.74pts (+/- 0.54) and the control group 0.67pts (+/- 0.62) (p> 0 05). In the second study, the average value for the study group was 0.3pts (+/- 0.47), and for the control group 1.06pts (+/- 0.46). The difference was 0.76 points and was statistically significant (p <0.02). Analysis of intra-group results showed a significant decrease in point values in the shoulder position after, the applied during the lesson, exercises (p <0.02).

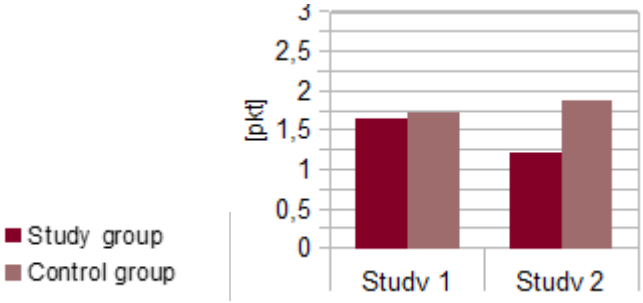

Fig. 6: Results of the evaluation of thoracic kyphosis according to the Kasperczyk method, noted in the research and control group in the first and second study

In the first intergroup study on thoracic kyphosis it was shown that the average value (Fig.6) for the study group was 1.65pts (+/- 0.77), and for the control group 1.73pts (+/- 0.7) (p > 0.05), while in the second study the average value for the research group was 1.21 points (+/- 0.6), and for the control group - 1.87 pts (+/- 0.1) (p <0.02). Analysis of intra-group results showed that for the examined group the result of thoracic kyphosis assessment, after the exercises used, decreased significantly by 0.44 points (p <0.01), while in the control group it increased by 0.14 pts (p> 0.05).

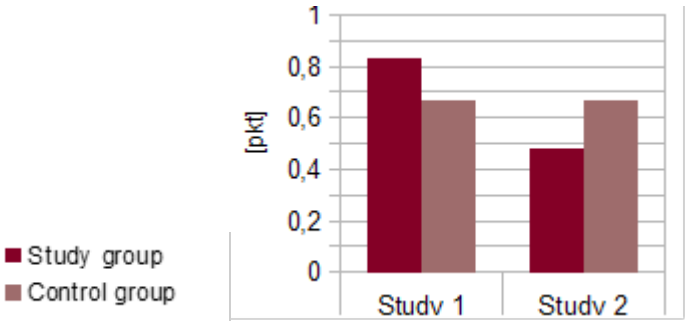

Fig. 7: Results of the evaluation of lateral curvature of the spine using the Kasperczyk method, listed in the research and control group in the first and second study

In the first study, the mean value of the lateral curvature of the spine (Fig. 7) for the study

group was 0.83 pts (+/- 0.58), and for the control group - 0.67 pts (+/- 0.62). The difference was 0.16 pts ($p < 0.05$). In the second study, the mean value for the study group was 0.48 points (+/- 0.51), and for the control group 0.67 pts (+/- 0.62). The difference was 0.19 pts and similarly it was not statistically significant. The analysis of intra-group differences showed that for the examined group the result of the lateral curvature of the spine, after the exercises used, decreased by 0.35 pts and it was statistically significant difference ($p < 0.01$), and for the control group between the first and the second measurement the difference was 0pts

Conclusions

The conducted observational study indicates a positive clinical effect of the, introduced during, lesson exercises with children in order to promote the correct posture.

Detailed applications:

1) in the study group under the influence of during the lesson exercises improved the range of mobility in both planes: sagittal and transverse in a significant way ($p < 0.05$)

2) in the study group, the during the lesson exercises reduced the angle of the sacral bone in the measurement of spine curvature ($p < 0.05$)

3) in the study group, during the lesson exercises had a positive effect on the symmetry of the shoulder position, decreased the occurrence of thoracic kyphosis and lateral spinal curvatures

Discussion

Physiotherapeutic and physioprophylactic actions are a long-term and comprehensive process. Our study showed an improvement in individual postural parameters, although the scope of improvement could probably be more beneficial with longer follow-up. The research shows that in the research group the greatest changes occur in the field of spine mobility in the sagittal and transverse planes. In 65.2% of children the range of motion in the sagittal plane increased. In the transverse plane during torsion of the torso towards the left improvement occurred in 70.4% of children, while for turning in the right direction in 69.9%. The improvement of the spine's mobility in the frontal plane was the smallest. During the bend of the spine to the left, the range of motion increased in 56.5% of children, and to the right in 69.6%. The elongation capacity of the spine improved slightly, and 13% of children achieved better results.

In the control group, there were insignificant changes of movements. A significant decrease in the range of mobility was noted only for the bend of the spine in the left ($p < 0.009$). It appeared in 53.3% of children. The bend of the spine towards the right improved in 33.3% of students and worsened in 60%. In the sagittal plane, 46.7% of children increased their range of motion and 53.3% decreased. In the transverse plane, the range when turning the spine to the left increased in 26.7%, and decreased in 46.7%. The twist of the spine towards the right improved in 20% of children, and worsened in 40%. The elongation capacity improved in 26.7% of students, and worsened in 46%. Changes, though insignificant, in a larger percentage concern the deterioration of movable ranges.

In the research group, in the first study, among 12 children the shape of thoracic kyphosis was normal, in the second study the standard was obtained by 16 people. In the shape of lumbar lordosis, the standard in the first study was obtained by 16 children, and in the second 18. 16 students obtained the norm in the setting of the sacrum during the first examination, while in the second group 19. In the control group that did not perform the exercises, the first norm obtained: 8 children (thoracic kyphosis), 7 children (lumbar lordosis), 10 children (setting of the sacrum bone). In the second study, the standard included: 9 children (thoracic kyphosis), 8 children (lumbar lordosis), 8 children (setting of the sacrum bone).

In the physiological curvature of the spine in the research group, the largest changes were seen in the setting of the sacrum (measurement I). The inclination angle decreased in 52.2% of children. The rest of the measurements did not change significantly. In the research group, in the first studies, the kyphotic type occurred in 26.1% of children, lordotic type in 47%, and the equivalent type in 21.6%. After a period of four-month exercises, the kyphotic type was visible in 21.7% of children, lordotic type in 43.5%, and the equivalent in 34.8%. In the control group, after the first tests, the kyphotic type was found in 26.7% of students, lordotic type in 40%, the type equivalent in 33.3%. In the second study, the kyphotic type was found in 20% of children, lordotic type in 40%, and the equivalent type in 40%. The most common type among all children was the lordotic type. This is due to the fact that children of this age are characterized by clearly marked lumbar lordosis and a small protrusion of the abdomen [10].

In addition to the regularity and continuity of the exercises, teachers and carers should pay attention that the children sit straight and actively spend their free time. Spine mobility studies were carried out in our study using a centimeter tape. You can also use other instruments. In

his study, K. Chromik et al. using the S-posturometer apparatus showed that there is no statistically significant relationship between spine mobility and the type of posture [1].

W. Łubkowska et al. presented norms of physiological curvatures for children at a younger school age [8]. Based on them, the changes taking place in shaping the physiological curvature of the spine after the four-month period of conducting the during the lesson exercises were presented.

The conducted research analysis by J. Drzał-Grabiec et al. [2] using the typology of Wolański in the Zeyland-Malawka modification showed that the most common type of posture in children in the study group was lordotic type, which was found in 47% of students. This study showed what type of spine shape is more common in boys and in girls. And so it was found that the lordotic type (52%) predominated in boys, while lordotic type (43%) and kyphotic (40.5%) in girls. Body and other methods could be used to assess body posture. Thus, M. Grabara et al. using a device based on photogrammetry showed that the dominant type of body posture among children was the lordotic type [4]. It can be assumed that during the lesson exercises have a positive effect on the shape of lumbar lordosis. However, it is necessary to introduce exercises that influence, to a greater extent, the improvement of the shape of thoracic kyphosis and cervical lordosis.

In the case of lateral spinal curvatures, significant changes were found in the research group in 8.7% of children, while in the control group in 6.7%. Similar research was carried out by the research team K. Rosa et al. [11]. Using the modified by E. Zeyland-Malawka test method of the New York City, "SzOP" rated the percentage of scoliosis in children, which was 6% in girls and 2% in boys. Differences in the obtained results may be due to the use of another research method. In the case of elementary music school students, asymmetry in the spine position in the frontal plane was demonstrated in 35.71% of children. Body posture evaluation tests carried out by A. Jankowicz-Szymańska et al. Were made using Staffell's staffing method [5]. The difference in the results of the frequency of asymmetry in the spine position in the frontal plane may be caused not only by another research method, but also by the fact that these children played instruments that asymmetrically engage the motor system. This resulted in loading only one side of the body. When the instruments were symmetrical, the defects usually arose in the sagittal plane.

The defects of body posture depend not only on external factors, but also on internal factors. A.Gogola et al. conducted studies assessing the relationship between the occlusion

plane and body posture, showing that in children with postural defects, malocclusion occur more frequently than in children who show normal posture. [3]

In the disorders of body posture among children, the awareness of parents and the school environment is also important. E. Skorupka and R. Asienkiewicz conducted research in 12 primary schools using the method of a diagnostic survey addressed to parents of children, physical education teachers and school nurses [14]. The aim of the survey was to assess the occurrence of postural defects in children, taking into account family and environmental conditions. In the group of 1021 children, postural disorders were found in 41% of girls and 19% of boys. In the group of 453 children, postural defects were found in 40% of students. The authors showed that the school has an important role in preventing postural defects. Similarly, M. Latalski et al. using the diagnostic survey method showed that the child's physical activity is strongly related to the occurrence of faulty postures and that the family's economic standards influence the awareness of one's own health [7]. They also described that there is a need to create an education system for parents and children, in which they will be educated about the disadvantages of attitudes and threats that are associated with them.

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