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**Wpływ terapii z wykorzystaniem  
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### SCHORZENIA STAWU BARKOWEGO - REHABILITACJA Z WYKORZYSTANIEM ELEMENTÓW TERAPII MANUALNEJ

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### DIAGNOSTYKA I LECZENIE MANUALNE W DYSFUNKCJACH STAWU KOLANOWEGO

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### PODSTAWY NEUROREHABILITACJI - UDAR MÓZGU - MODUŁ 1

Szkolenie obejmuje zajęcia teoretyczne omawiające mechanizm udaru mózgu i jego następstwa kliniczne, diagnostyki dla potrzeb fizjoterapii, rokowań, mechanizmów zdrowienia, plastyczności układu nerwowego oraz aktualne zalecenia dotyczące fizjoterapii pacjentów po udarze mózgu. Zajęcia praktyczne to przykłady terapii pacjentów w okresie wczesnej i wtórnej rehabilitacji, propozycje rozwiązywania problemów strukturalnych i funkcjonalnych oraz wykorzystanie metody Bobathów w rehabilitacji pacjentów po udarze mózgu.

### PODSTAWY NEUROREHABILITACJI - UDAR MÓZGU - MODUŁ 2

Szkolenie obejmuje warsztaty praktyczne z zakresu diagnostyki funkcjonalnej pacjentów, podstawowych problemów strukturalnych i funkcjonalnych oraz propozycje terapii: reedukacji funkcji kończyny górnej i dolnej oraz wybranych strategii rehabilitacji. Omawiane jest również zagadnienie dysfagii, w tym objawy zaburzeń połykania, testy i ocena zaburzeń, zasady bezpiecznego karmienia, strategie terapeutyczne, ćwiczenia miofunkcyjne oraz specjalne techniki ułatwiające połykanie.

### SCHOROZENIA NARZĄDÓW RUCHU U DZIECI I MŁODZIEŻY - ZASADY I KRYTERIA LECZENIA ORTOPEDYCZNEGO

Szkolenie obejmuje zagadnienia wad postawy u dzieci i młodzieży, wad wrodzonych narządów ruchu, wczesnego wykrywania nabytych schorzeń narządów ruchu, naukę badania ortopedycznego oraz zbierania wywiadu oraz praktyczne wskazówki oraz koncepcje w stosowaniu ortez i aparatów ortopedycznych. Szkolenie skierowane do lekarzy ortopedów, pediatrów, lekarzy rodzinnych, lekarzy rehabilitacji medycznej, fizjoterapeutów oraz średniego personelu medycznego.

### WSPÓŁCZESNE METODY LECZENIA WYBRANYCH DYSFUNKCJI STAWU SKOKOWEGO I STOPY

Szkolenie obejmuje zagadnienia z anatomii, biomechaniki stawu skokowego i stopy, metodyki badania stopy, postępowania w leczeniu urazów stawu skokowego i stopy, nabytych zniekształceń stopy (przyczyny, objawy, sposoby postępowania) oraz pozostałych dysfunkcjach w obrębie stawu skokowego i stopy (entezopatie, przeciążenia, zapalenia, zespoły uciskowe nerwów, gangliony, zmiany zwyrodnieniowe, stopa cukrzycowa, stopa reumatoidalna).

### CHOROBA ZWYRODNIENIOWA STAWÓW - ALGORYTM POSTĘPOWANIA DIAGNOSTYCZNO-TERAPEUTYCZNEGO

Szkolenie obejmuje następujące zagadnienia: choroba zwyrodnieniowa stawów - podstawowe pojęcia, algorytm postępowania diagnostyczno-terapeutycznego, nowoczesne metody leczenia w chorobie zwyrodnieniowej stawów, nauka prawidłowej oceny zaawansowania choroby zwyrodnieniowej w oparciu o wywiad, badania ortopedyczne i badania dodatkowe, zastosowanie ortez i aparatów ortopedycznych w chorobach zwyrodnieniowych. Szkolenie skierowane do lekarzy ortopedów, pediatrów, lekarzy rodzinnych, lekarzy rehabilitacji medycznej, fizjoterapeutów oraz średniego personelu medycznego.

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### MÓZGOWE PORAZENIE DZIECIĘCE - ALGORYTM POSTĘPOWANIA DIAGNOSTYCZNO-TERAPEUTYCZNEGO

Szkolenie obejmuje następujące zagadnienia: MPD - zespół symptomów, etapy leczenia, cele i wskazówki terapeutyczne, kwalifikacje pacjenta do danego etapu leczenia, nauka badania ortopedycznego w Mózgowym Porażeniu Dziecięcym, zastosowanie ortez i aparatów ortopedycznych w MPD. Szkolenie skierowane do lekarzy ortopedów, pediatrów, lekarzy rodzinnych, lekarzy rehabilitacji medycznej, fizjoterapeutów oraz średniego personelu medycznego.

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# Ocena postawy ciała dzieci w wieku przedszkolnym

*Assessment of Body Posture in Children of Kindergarten Age*

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## Streszczenie

Cel pracy. Celem pracy jest charakterystyka postawy ciała dzieci w wieku przedszkolnym z dwóch grup wiekowych (4 i 5 lat), ocena ruchomości obręczy barkowej i biodrowej, oraz ocena siły mięśniowej wybranych mięśni posturalnych.

Materiał i metody. Do badania zakwalifikowanych było 50 dzieci w wieku 4 i 5 lat. W grupie tej znalazło się 28 dziewcząt i 22 chłopców. Badania zostały przeprowadzone za zgodą Komisji Bioetyki Uniwersytetu Medycznego w Łodzi. Osoba badana stała w pozycji swobodnej, rozebrana do bielizny. Ocena postawy była przeprowadzana za pomocą obserwacji z odległości dwóch metrów, oraz za pomocą badania palpacyjnego. Podczas badania użyto protokołu badania według Kasperczyka, wykonano test ścienny Degi, test Thomasa, próbę pseudo-Laseque'a, oraz dokonano pomiaru masy ciała i wzrostu. Badaniami dodatkowymi był test Lovette'a na mięśnie pośladkowe wielkie, oraz mięsień prosty brzucha.

Wyniki. W wykonanych testach nie stwierdzano wysoce istotnej różnicy wyników w zależności od płci dzieci. Stwierdzono jedynie wysoce istotną zależność między wynikami oceny ustawienia brzucha w zależności od płci. Płaski brzuch występował u 22,73% chłopców, ale u żadnej z dziewczynek.

Istotną różnicę stwierdzono w porównaniu dzieci pod względem wieku w badaniu masy ciała, wzrostu – dzieci starsze są cięższe i wyższe. W przypadku zależności między wynikami testu Degi w zależności od wieku badanych dzieci wynik jest istotny, czyli u dzieci w wieku 5 lat znacznie mniej jest przypadków z wynikiem ujemnym.

Wnioski. 1. Postawa ciała u dzieci przedszkolnych wykazuje duże zróżnicowanie osobnicze. 2. Często obserwowane u dzieci w wieku przedszkolnym lordotyczne typy postawy oraz koślawość kolan stanowią wariant normy rozwoju ontogenetycznego. 3. Wyniki testu Lovette'a wskazują na dobry, a nawet bardzo dobry stan siły mięśniowej w zakresie mięśni pośladkowych wielkich i mięśni brzucha. 4. Wyniki testów Degi, Thomasa i testu pseudo-Laseque'a wykazują częste występowanie przykurczy mięśni stawu barkowego i biodrowego. 5. U dzieci w wieku 4-5 lat często obserwuje się nieprawidłowe (spłaszczone lub płaskie) wysklepienie stóp. 6. Występowanie u dużej liczby dzieci w wieku przedszkolnym nieprawidłowości w zakresie postawy ciała, wskazuje na konieczność podejmowania wczesnych działań leczniczo-korekcyjnych, celem uniknięcia utrwalenia wad postawy w wieku późniejszym.

## Słowa kluczowe:

postawa ciała, dzieci, ocena zakresu ruchu, mięśnie posturalne

## Abstract

Study Goal. The goals of this study are: to examine body posture in children of kindergarten age in two ages groups (4 and 5 years), assess the range of motion of the shoulder and hip joints, as well as that of tensile strength of certain postural muscles.

Materials and methods. The sample size for this study consisted of 28 girls and 22 boys (n = 50).

This study was conducted in accordance with guidelines set by the Bioethical Commission of the Medical University of Łódź. Each subject was asked to disrobe to his/her undergarments and stand upright in a comfortable position. The assessment of his/her posture was performed based on both visual observation from a distance of 2 m and by palpation. Kasperczyk's Protocol as well as the Dega, Thomas, and pseudo-Laseque's tests were utilized in each assessment. In addition, the body mass and height of each subject was measured. Lovette's test was utilized in the assessment of strength of the gluteus muscles and the rectus abdominis.

Results. No statistically significant correlation was found in this study between gender and age, however a statistically significant correlation was found between abdominal posture and gender: a flat abdomen was found in 22.73% of boys, but in none of the girls, in this study. An important contrast was found when comparing test subjects based on age in the assessment of body mass: older children were heavier and taller. In terms of the correlation between the Dega test results and age, the results were significant: there were far fewer cases of negative results in children aged 5 years.

Conclusions. 1. Body posture in children of kindergarten age varies greatly for each individual. 2. Lordotic postures or varus/valgus knees, frequently observed in children at this age, are normal variants of ontogenetic development. 3. Results of Lovette's test indicate good, if not very good, strength of the gluteus maximus and rectus abdominis muscles. 4. Results of Dega, Thomas, and pseudo-Laseque's tests indicate frequent contractions of the muscles of the shoulder and hip joints. 5. In children aged 4-5 years, improper arching of the feet is frequently evident. 6. The occurrence of abnormalities in body posture occurs in many children of kindergarten age is an indication of the need for corrective treatment to be implemented as early as possible, so as to avoid the permanent fixation of these abnormalities later in life.

## Key words:

Body Posture, children, assess the range of motion, postural muscles



## Introduction

The modern lifestyle of children consists of adopting a sitting position for the majority of their waking hours as well as a lack of physical activity and improper ergonomic conditions, which contribute to abnormalities in body posture [1]. Working to develop proper body posture should be a priority for all parents, teachers, as well as doctors and physiotherapists [2]. At the end of the 20th century, these abnormalities were acknowledged as a societal phenomenon, which resulted in their being recognized not only among individual health professionals, but also entire research groups [3]. The reason for this was the growing body of troubling information that emerged concerning the state of health of children and adolescents of kindergarten and school age, in whom abnormalities in body posture were being observed with greater frequency. At the beginning of the 1980s, 30% of children suffered from an abnormality, today this problem has reached 70-80% of children and early adolescents [4]. The ages between 5-7 years is considered as critical in childhood development. This is most likely due to children's lifestyle changes at this age. A change occurs from an individually controlled lifestyle in which children are suddenly required to assume a sitting position over many hours at a time, in the majority of cases an improper one [5,6]. Abnormalities in posture during this period can usually be prevented by increased physical activity in children, developing a habit of maintaining proper posture when standing up, sitting down, as well as reclining. Mild, pre-existing abnormalities can be treated by compensatory and corrective gymnastics [7].

It is most important for parents, as well as teachers, caregivers and other individual in supervisory roles, to understand the importance of proper posture in a healthy childhood [8]. Rapid advancements in electronics and technology have resulted in exponential progress in the field of healthcare, including physiotherapy and diagnostics and treatment. There is therefore a chance that our future descendants will pride themselves in impeccable posture, however this can only be achieved with much effort [9].

## Aim

The purposes of this study are: the characterization of body posture in children of kindergarten age in two age groups (4 and 5 years), the assessment of the mobility of the rotator cuffs of the shoulder and hip, and that of the strength of the postural muscles of interest.

Improper body posture entail deviations in the standing position of the body away from normal that are biomechanically detrimental. Posture such as this can cause secondary changes in organ function, which is the reason why early detection is essential. According to Nowotny, postures on the border between normal and abnormal are pathological [10].

Pathological postures are characterized by reversible deviations from the norm. The basis of pathology is determined by those body positions that are detrimental to



the body [10]. Kasperczyk considers pathological postures to be deformation of the spinal column, thorax, pelvis or lower limbs. Pathological posture can manifest as simple and compound deviations [3]. Abnormalities in body posture consist of parts of the body having adopted pathologically habitual standing positions.

Abnormalities in body posture are not only physically disfiguring but they are also a reason for detrimental physiological changes. The pulmonary and cardiovascular system, as well as the musculature of the abdomen, can adversely affect the body as a whole. Furthermore, individuals suffering from poor posture are also susceptible to secondary pathologies such as a reduced volume of the chest cavity, reduced range of motion of various joints, and reduced cardiopulmonary efficiency [11]. For these reasons, prophylaxis and early screening is essential to implement treatment as early as possible. Physical activity promotes an increase in overall fitness, increased range of motion in the joints, as well as the correction and reduction of various abnormalities in body posture [12].

The course of development of abnormalities can be divided into three phases: Phase I – functional changes. One muscle group undergoes relaxation and loosening, while another group undergoes flexion and becomes more tense. This phase can last from weeks to months. Phase II – development of contractions. Intervention in the form of corrective exercises during this phase can still be effective. This phase can last weeks, months, even years. Phase III – ingrained contractions. In this phase abnormalities are considered as pathological. Corrective exercises are only effective in preventing abnormalities from developing further; their complete elimination is impossible. A combination of a rehabilitation regimen with surgical intervention is often required [3, 13].

### **Materials and methods**

Data was collected between 2012 and 2013 at Public Kindergarten No. 6 in Łask, Poland. Fifty children aged 4 and 5 years were eligible for this study, 28 girls and 22 boys. All subjects along with their parents were informed of the purposes of this study and the nature of the data collection. The benefits of participating in this study were also presented to all involved. All data collection took place upon each subject's parents giving their informed written consent and each subject giving his/her oral consent. Every subject was informed of their right to freely withdraw their consent during any phase of the data collection, without consequence. During data collection, all of the subjects were physically and mentally healthy and none reported any medical ailments.

All testing was conducted in accordance with the Bioethics Committee of the Medical University of Łódź. Each test subject was asked to disrobe to his/her undergarments and assume a natural standing position. Body posture was assessed by visual observation at a distance of 2 metres, as well as by palpation. The primary educator of each group of children was present for the data collection of each subject in that group. The following analytical tests were applied to the data collected:



- Kasperczyk's test – every subject was examined visually and by palpation according to the criteria of this test,
  - Dega wall test – the purpose of utilizing this test was to detect limitations in the range of motion of the rotator cuff of the shoulder. Each test subject assumed a sitting position with his/her back against a wall. They were then asked to raise their upper limbs. For those subjects who were unable to touch the wall with their upper limbs, the angle of their upper limbs to the wall was interpreted as the degree of their muscle contraction [9].
  - Thomas test – this test allows for the detection of contractions of the hip flexors. The subject lies on his/her back and lifts either lower limbs, bent at the knee, up to the chest. If the opposite thigh elevates above the lying surface, the angle of the raised limb to the surface is interpreted as the degree of the contraction of the hip flexors [9].
  - Pseudo-Laseque' test – this test serves in the determination of contractions of the hamstring muscles. The subject lies on his/her back while the examiner lifts the lower limbs by the heel and, with the foot in dorsiflexion, bends the lower limb at the hip while keeping the limb straight by placing the other hand on the subject's knee. The difference between the proper range of hip flexion and that which the subject is capable of achieving is the degree of hamstring contraction [9].
  - Lovette's test – Only the 3rd, 4th, and 5th variations were utilized in this study, as such only these are described. The subject lies in the prone position with the lower limb being examined bent at the knee for the purpose of exclusion of the hamstring muscles. The examiner stabilizes the pelvis while the subject attempts to extend the knee. This maneuver determined the muscular strength in the 3rd degree. The 4th and 5th degrees of this test comprise of the same maneuver, however, in the 4th degree the examiner exerts resistance to extension at the midpoint of the thigh; in the 5th degree, approximately 2 cm proximal to the popliteal fossa [9].
  - Lovette's test of the rectus abdominis – the subject reclines on his/her back with both hips and both knees flexed and the feet flat on the reclining surface. In the 3rd degree the upper limbs are folded across the chest, in the 4th they are placed at the back of the neck, and in the 5th they are held straight up. The subject attempts to change to a sitting position [9].
- The body mass and height of each subject was also measured. The results were analyzed with the statistical software program PQStat ver. 1.4.2.324. Differences in body mass and height based on gender and age were analyzed utilizing the Mann-Whitney U test, while the comparison of each group of subjects based on gender and age together was performed with the Kruskal-Wallis and post-hoc Dunn tests. The correlation between the remaining scales and the gender and age of the subjects were determined with the chi2 test. The statistical significance was designated at  $p < 0.05$  while a high statistical significance was designated at  $p < 0.01$ .

## Results

With respect to body weight, no statistically significant results ( $p = 0.0947$ ) were determined based on gender. In case of body weight, there was no significant difference in results depending on the sex of the children. However, a hi-

ghly statistically significant result was found ( $p = 0.0069$ ) with regards to age: older children were of a higher body mass than younger children. A comparison of the groups based on age and gender was statistically significant ( $p = 0.0102$ ), while a highly statistically significant result ( $p = 0.0085$ ) was found concerning girls aged 5 years with respect to boys aged 4 years. A comparison of girls aged 4 and 5 years yielded no statistical significance ( $p = 0.4866$ ) based on body mass. A similar comparison of boys aged 4 and 5 years exhibited a statistically insignificant ( $p = 0.1360$ ) difference in body mass. The results of the body masses of each subject group are presented in Table 1.

**Table 1. Body masses of each subject group**

	descriptive statistics							U Manna-Whitney Test
	mean	SD	min.	lower quartile	median	upper quartile	max.	
Total	20.5	2.2	16.0	19.0	20.0	22.0	25.0	0.0947
Girls	21.0	2.3	17.0	19.5	21.0	22.5	25.0	
Boys	19.9	2.1	16.0	19.0	20.0	21.0	25.0	
Children								0.0069
4 years	19.7	2.1	16.0	18.0	20.0	21.0	24	
5 years	21.6	2.1	18.0	20.0	22.0	23.0	25.0	
/Girls								0.0102
4 years	20.3	2.2	17.0	19.0	20.0	22.0	24.0	
5 yearst	22.0	2.1	19.0	20.0	22.0	24.0	25.0	
Boys								
4 years	18.9	1.7	16.0	17.5	19.0	20.0	22.0	
5 years	21.1	2.0	18.0	20.0	21.0	22.0	25.0	

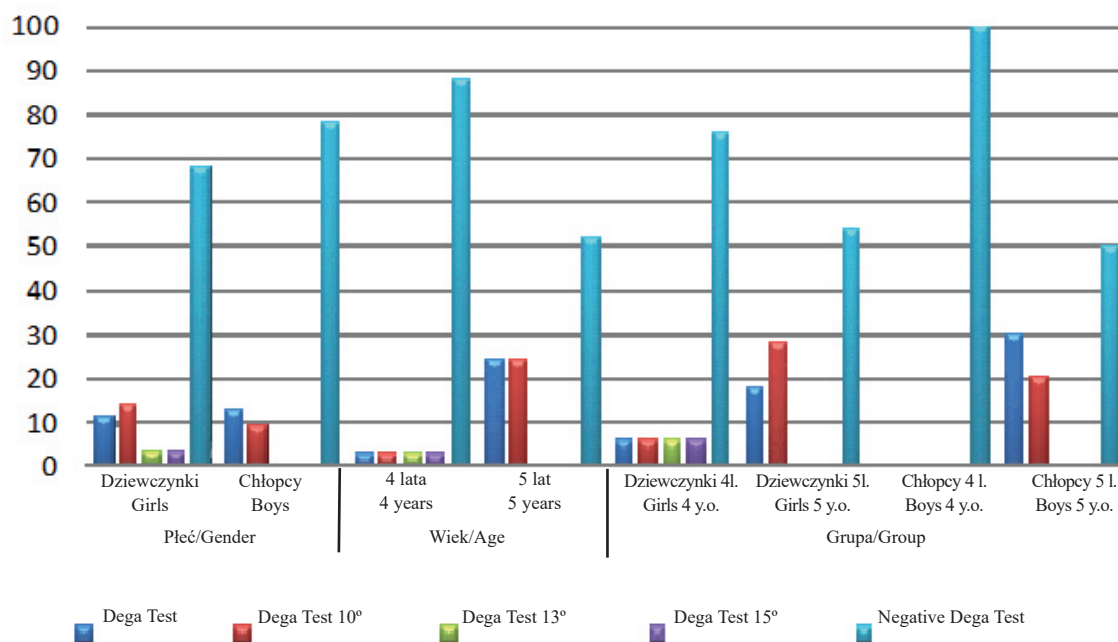
**Table 2. Heights of each subject group.**

	descriptive statistics							U Manna-Whitney Test
	mean	SD	min.	lower quartile	median	upper quartile	max.	
Total	117.3	5.1	106.0	115.0	119.0	120.0	125.0	0.0542
Girls	116.1	5.4	106.0	112.5	119.0	120.0	125.0	
Boys	118.7	4.4	106.0	118.0	120.0	121.0	125.0	
Children								0.0029
4 years	115.6	5.2	106.0	114.0	118.0	120.0	122.0	
5 years	119.6	4.0	108.0	119.0	120.0	121.0	125.0	
Girls								0.01
4 years	114.6	5.3	106.0	108.0	116.0	119.0	120.0	
5 yearst	118.5	4.8	108.0	118.0	120.0	121.0	125.0	
Boys								
4 years	116.9	5.0	106.0	114.5	118.5	120.5	122.0	
5 years	120.9	2.3	118.0	120.0	120.0	123.0	125.0	

A highly statistically significant difference ( $p = 0.0029$ ) was evident with regards to age: older children were taller than younger children. A comparison of the subject groups based on age and gender yielded a highly statistically significant result ( $p = 0.0064$ ), while a highly statistically significant result ( $p = 0.0057$ ) was also obtained concerning girls aged 4 years and boys aged 5 years.



With respect to height, no statistically significant result was found ( $p = 0.0542$ ) based on gender. However, a highly statistically significant difference ( $p = 0.0029$ ) was evident with regards to age: older children were taller than younger children. A comparison of the subject groups based on age and gender yielded a highly statistically significant result ( $p = 0.0064$ ), while a highly statistically significant result ( $p = 0.0057$ ) was also obtained concerning girls aged 4 years and boys aged 5 years. A comparison between girls and boys aged 4 and 5 years yielded statistically insignificant ( $p = 0.1611$  and  $p = 0.3983$ , respectively) differences in height. The results concerning the heights of each subject group are summarized in Table 2.



**Fig. 1. Results of Dega wall test for age and gender**

A statistical significance was found in the results of the Dega wall test with respect to subject age ( $p = 0.0189$ ): far fewer cases of children aged 5 years with negative results. Seventy-two percent of children were found to have a negative result, while 12% had results of 5° and 10° and 2% of 13° and 15°. There was no significant relationship ( $p = 0.5361$ ) of the evalu-

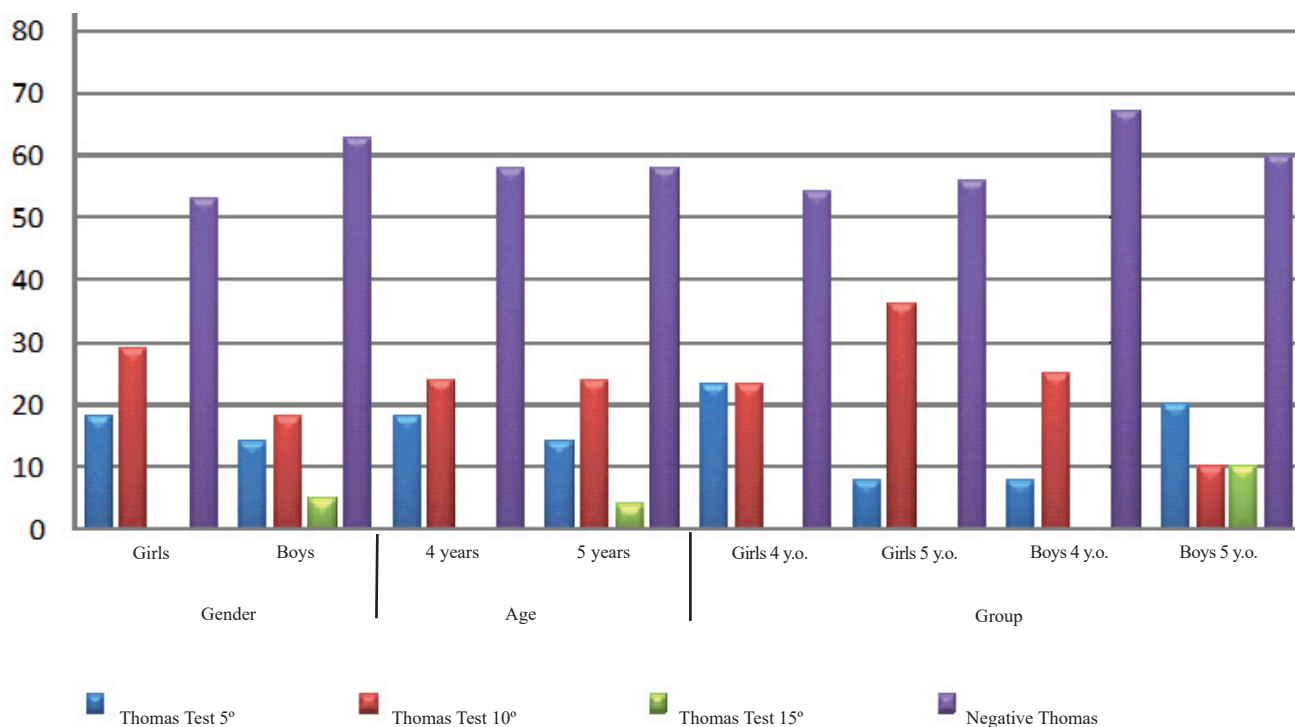


Fig. 2. Results of Thomas test for age and gender

ation results of Thomas test according to gender. There was no significant relationship ( $p = 0.6933$ ) of the evaluation results of Thomas test depending on age. There was no significant relationship ( $p = 0.6106$ ) of the evaluation results of Thomas test depending on the group in terms of sex and age. This indicates no correlation between contraction of hip flexors with age or gender in the subject children. 58% of test subjects had a negative result: 16% of 5°, 24% of 10°, and 2% of 15°.

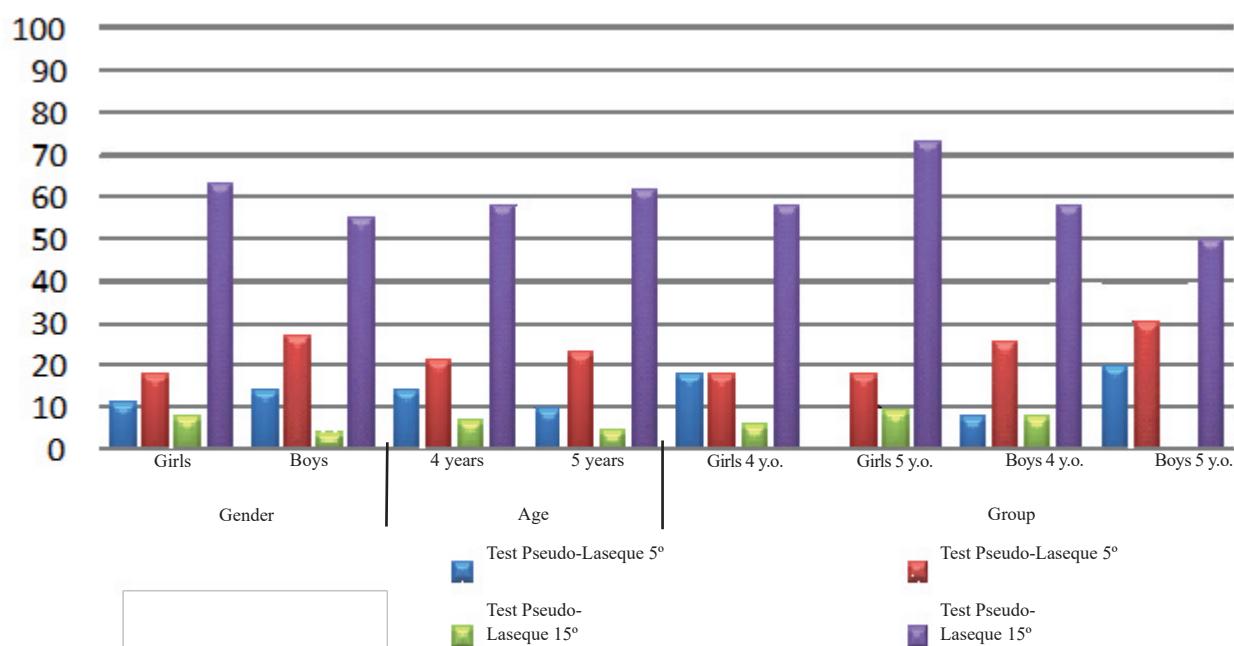


Fig. 3. Results of Pseudo- Laseque's for age and gender



There was no significant relationship ( $p = 0.8212$ ) of the evaluation results of Pseudo-Laseque's test according to gender. There was no significant relationship ( $p = 0.9497$ ) of the evaluation results of Pseudo-Laseque's test depending on age. There was no significant relationship ( $p = 0.8864$ ) of the evaluation results of Pseudo-Laseque's test depending on the group in terms of sex and age. This indicates no correlation between contraction of the hamstrings with the age of gender of the subject children. Sixty percent of test subjects had a negative result: 12% with a result of  $5^\circ$ , 22% with  $10^\circ$ , and 6% with  $15^\circ$ .

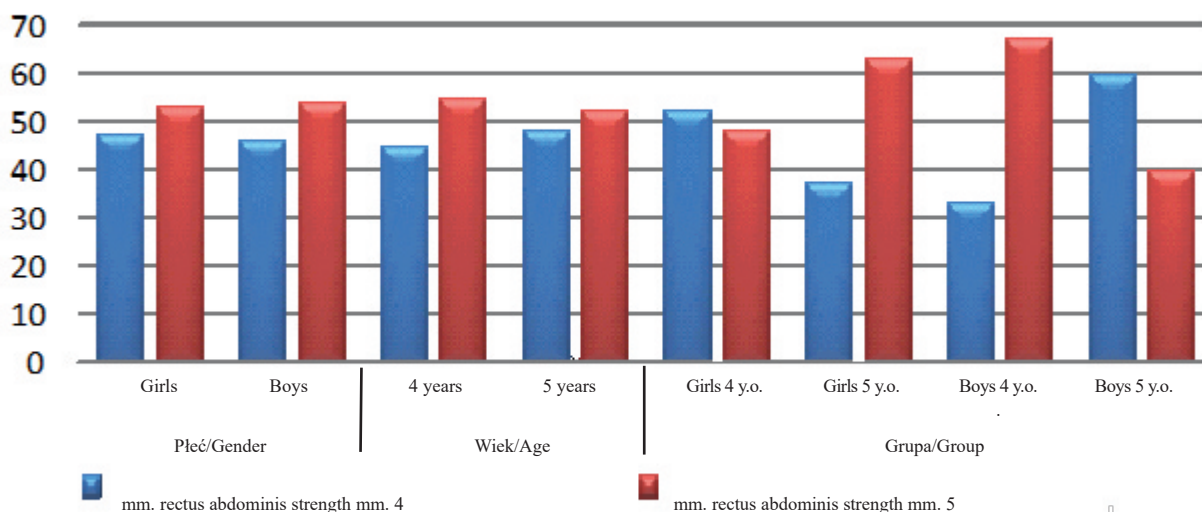


Fig. 4. Results of Lovette's test – m. rectus abdominis for age and gender

There was no significant relationship ( $p = 0.9453$ ) of the evaluation results of Lovette's test of m. rectus abdominis according to gender. There was no significant relationship ( $p = 0.8450$ ) of the evaluation results of Lovette's test of m. Rectus abdominis depending on age. There was no significant relationship ( $p = 0.5115$ ) of the evaluation results of Lovette's test of m. Rectus abdominis depending on the group in terms of sex and age. Forty-six percent of subject children were found to have a muscular strength assessed as 4 and 54% as 5.

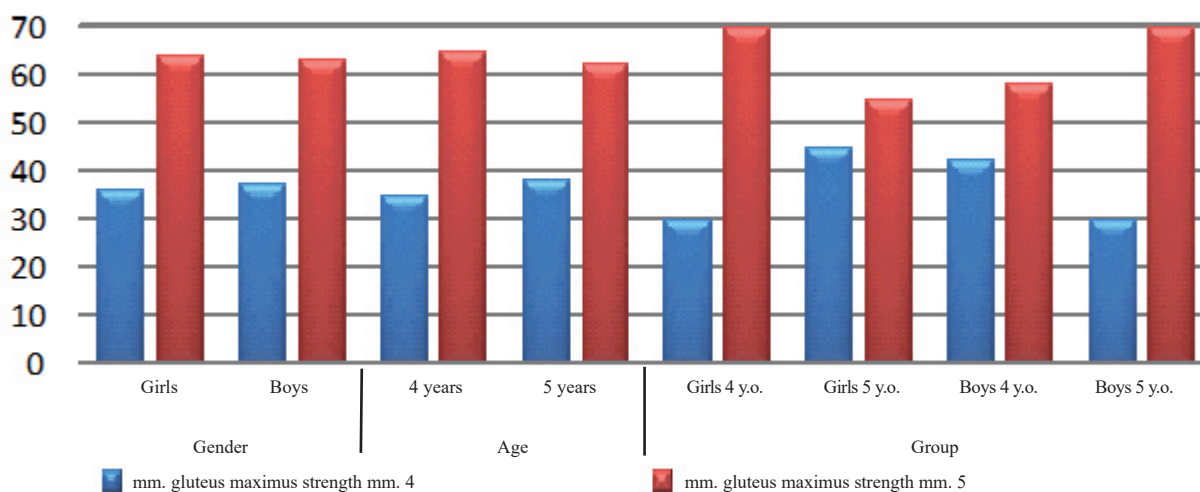
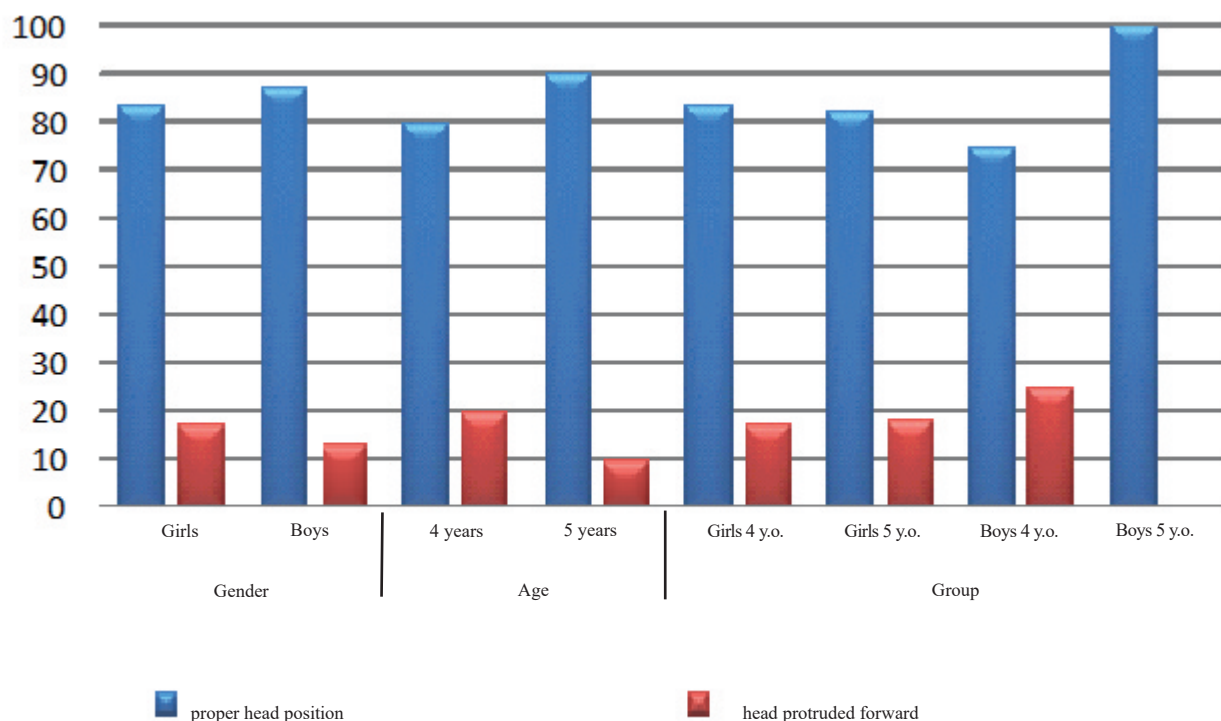


Fig. 5. Results of Lovette test – m. gluteus maximus for age and gender

There was no significant relationship ( $p = 0.8031$ ) of the evaluation results of Lovette's test of m. Gluteus maximus according to gender. There was no significant relationship ( $p = 0.9714$ ) of the evaluation results of Lovette's test of m. Gluteus maximus depending on age. There was no significant relationship ( $p = 0.7842$ ) of the evaluation results of Lovette's test of m. gluteus maximus depending on the group in terms of sex and age. Thirty-six percent of subject children were found to have muscular strength assessed as 4 and 64% as 5.



**Fig. 6. Results of head position for age and gender**

There was no significant relationship ( $p = 0.9876$ ) of the evaluation results of head position according to gender. There was no significant relationship ( $p = 0.5015$ ) of the evaluation results of head position depending on age. There was no significant relationship ( $p = 0.4400$ ) of the evaluation results of head position depending on the group in terms of sex and age. Eighty-four percent of subject children were found to have a proper head position: the nose not protruding beyond the manubrium, 16% of the subjects' heads protruded forward but whose faces did not protrude beyond the manubrium.



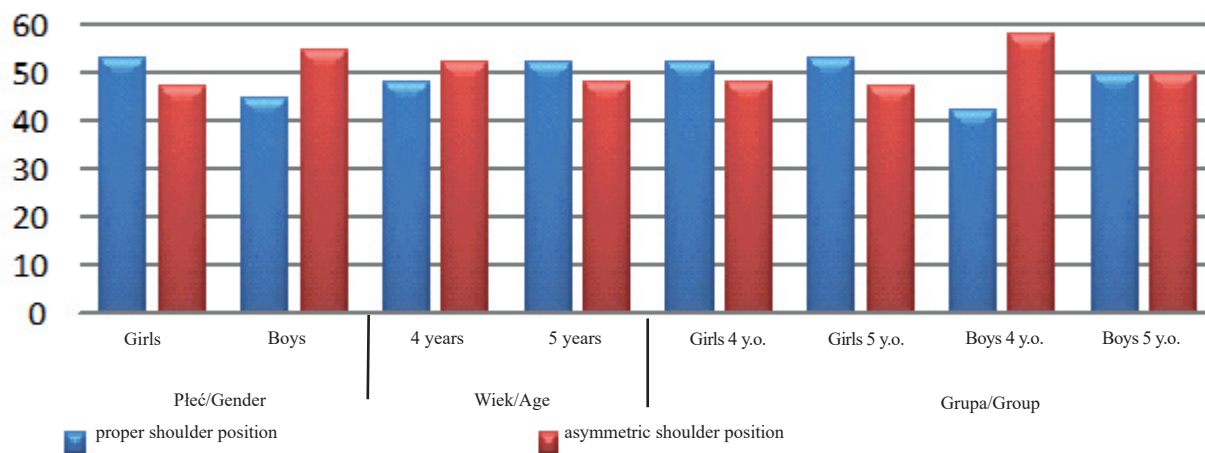


Fig. 7. Results of shoulder position for age and gender

There was no significant relationship ( $p = 0.5688$ ) of the evaluation results of shoulder position according to gender. There was no significant relationship ( $p = 0.7745$ ) of the evaluation results of shoulder position depending on age. There was no significant relationship ( $p = 0.9226$ ) of the evaluation results of shoulder position depending on the group in terms of sex and age. A comparison of girls aged 4 and 5 years yielded a statistically insignificant ( $p = 0.7605$ ); for boys aged 4 and 5 years the correlation was statistically insignificant ( $p = 0.9688$ ). Half of the children examined were found to have proper posture.

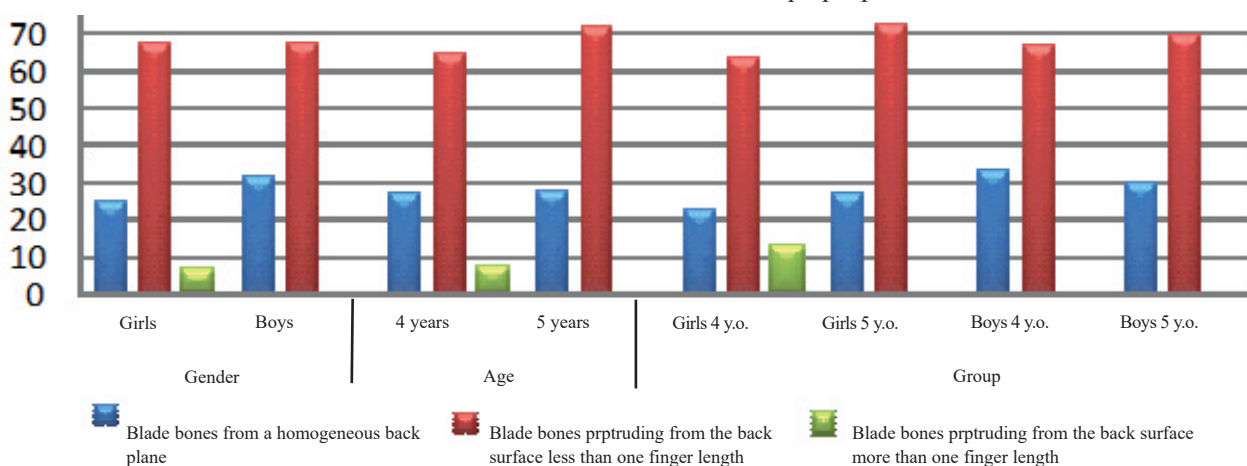


Fig. 8 The evaluation results of blade bones position according to gender and age

There was no significant relationship ( $p = 0.4114$ ) of the evaluation results of blade bones position according to gender. There was no significant relationship ( $p = 0.4688$ ) of the evaluation results of blade bones position depending on age. There was no significant relationship ( $p = 0.6477$ ) of the evaluation results of blade bones position depending on the group in terms of sex and age. The comparison of the results of girls aged 4 and 5 showed a negligible ( $p = 0.3507$ ) correlation similar to the comparison between boys aged 4 and 5 years ( $p = 0.7699$ ). In

28% of the cases, the shoulders form a homogeneous back plane, 68% of the children have shoulder blades protruding from the back surface less than one finger length. On the other hand, 4% of the results represent blade bones that extend from the back plane more than one finger length.

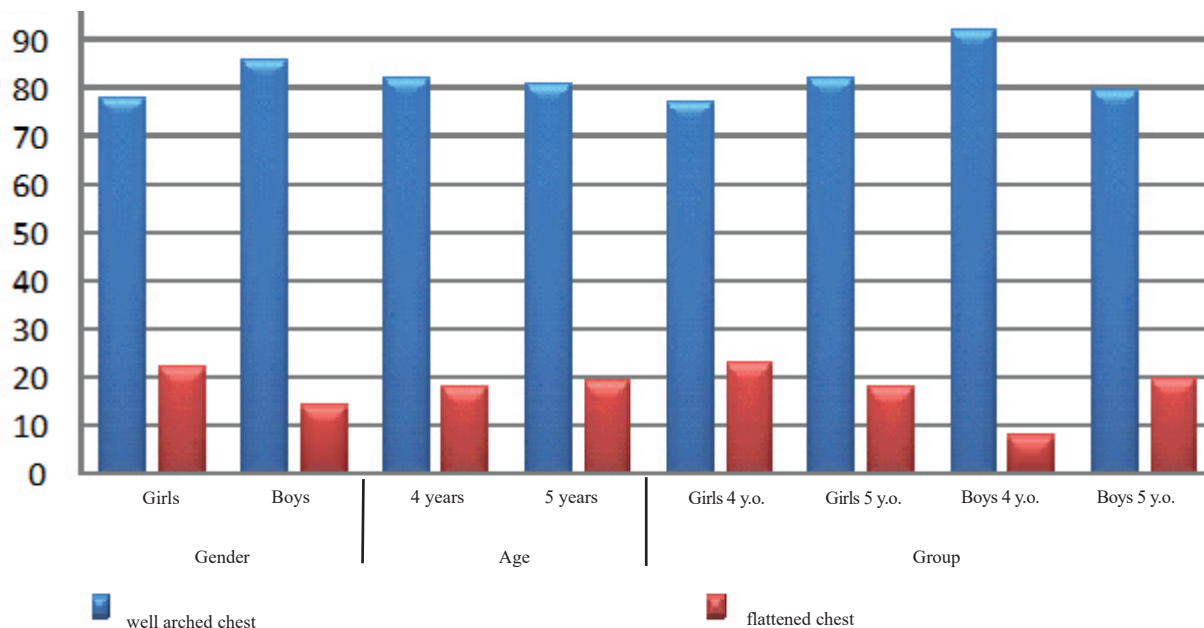


Fig. 9. The evaluation results of the chest shape depending on gender and age

There was no significant correlation ( $p = 0.7330$ ) of the evaluation results of the chest shape depending on sex. There was no significant correlation ( $p = 0.8346$ ) of the evaluation results of the chest shape depending on age. There was no significant correlation ( $p = 0.7676$ ) of the evaluation results of the chest shape depending on the group in terms of gender and age. The comparison of the results of girls aged 4 and 5 showed a negligible ( $p = 0.8928$ ) correlation, similar to the comparison of boys aged 4 and 5 years where the relationship was also insignificant ( $p = 0.8649$ ). 82% of cases show a well arched chest; The furthest front part of the body is the front wall of the chest and 18% of the subjects have a flattened chest.

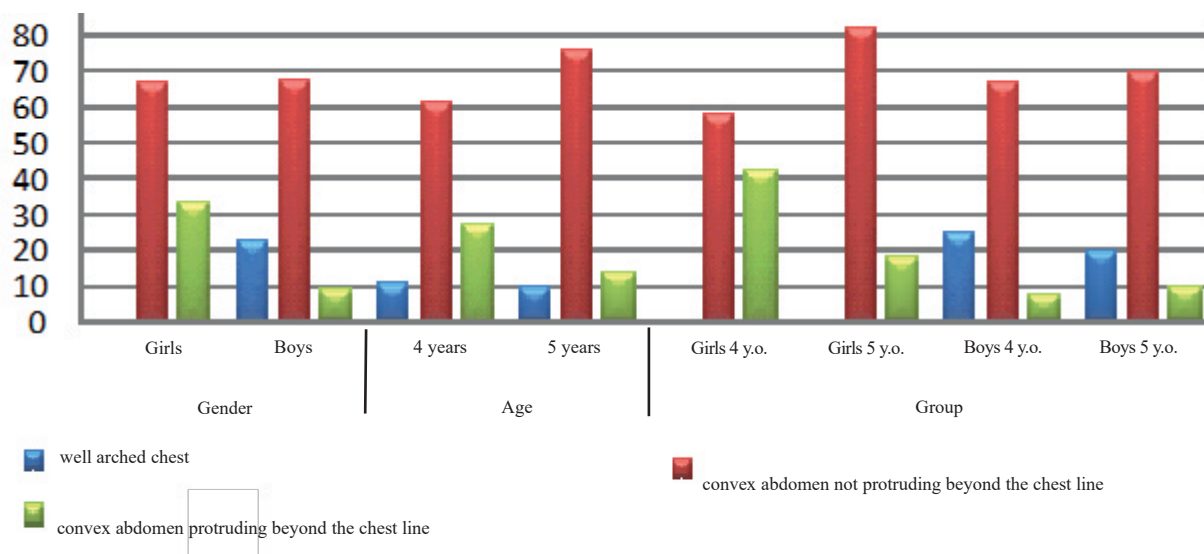
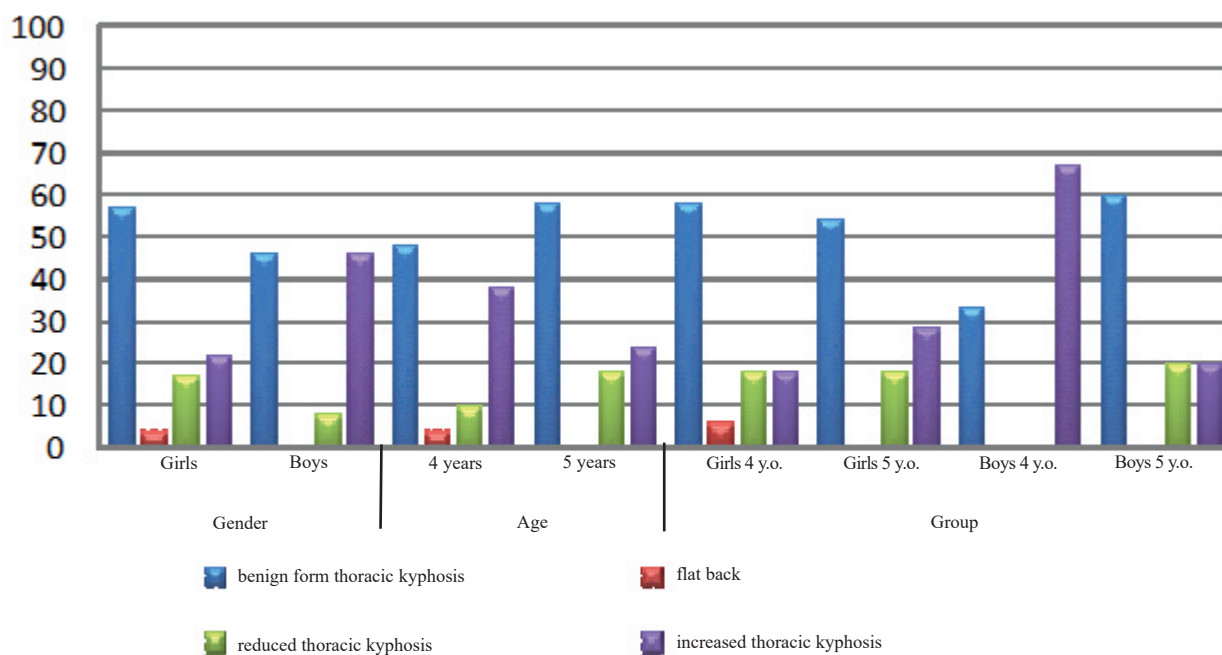


Fig. 10. The evaluation results of abdomen position according to gender and age



A significant ( $p = 0.0094$ ) correlation was found between the results of the abdomen position according to sex and the flat abdomen occurred in 22.73% of the boys, but in none of the girls. There was no significant relationship ( $p = 0.5105$ ) of the assessment results of abdomen position based on age. There was no significant relationship ( $p = 0.0711$ ) of the assessment results of abdomen position depending on the group in terms of sex and age. The comparison of the results of girls aged 4 and 5 showed a negligible ( $p = 0.3908$ ) correlation, similar to the comparison of boys aged 4 and 5 years where the relationship was also insignificant ( $p = 0.9581$ ). In 10% of children the abdomen is flat and in 68% it is convex but not protruding beyond the chest line, while in 22% of the cases the abdomen is convex, protruding beyond the chest line.



**Fig. 11. The evaluation results of thoracic kyphosis according to gender and age**

There was no significant relationship ( $p = 0.2606$ ) of the evaluation results of thoracic kyphosis depending on gender. There was no significant relationship ( $p = 0.5075$ ) of the evaluation results of thoracic kyphosis depending on age. There was no significant relationship ( $p = 0.2494$ ) of the evaluation results of thoracic kyphosis depending on the group in terms of sex and age. The comparison of the results of girls aged 4 and 5 showed a negligible ( $p = 0.8134$ ) correlation, similar to the comparison of boys aged 4 and 5 years where the relationship was also insignificant ( $p = 0.0532$ ). In 52% of the cases a benign form of chest kyphosis was found. 32% reported increased chest kyphosis. In 14% of the cases there was reduced chest kyphosis and in 2% flat back.

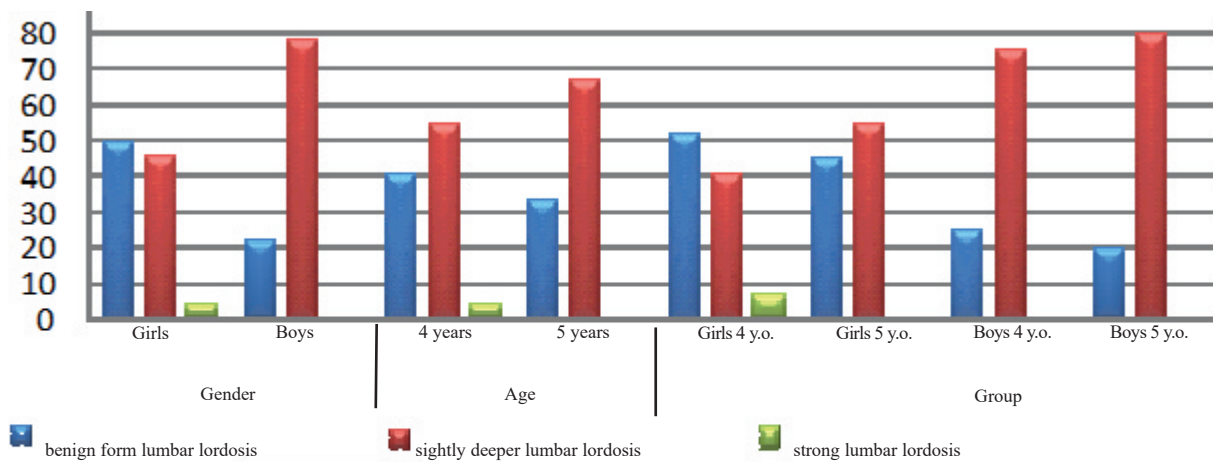


Fig. 12. Lumbar lordosis evaluation results according to gender and age

There was no significant relationship ( $p = 0.0761$ ) of the results of lumbar lordosis evaluation according to gender. There was no significant relationship ( $p = 0.5489$ ) of the lumbar lordosis evaluation results according to age. There was no significant relationship ( $p = 0.3532$ ) of lumbar lordosis assessment results in terms of age and gender. The comparison of the results of girls aged 4 and 5 showed negligible ( $p = 0.6129$ ) correlations similar in the comparison between boys aged 4 and 5 years where the relationship was also insignificant ( $p = 0.8164$ ). In 38% of the cases the result is a mildly outlined shape and in 60% of the cases the lumbar lordosis is slightly deeper, whereas 2% of the children studied had a strong lumbar lordosis.

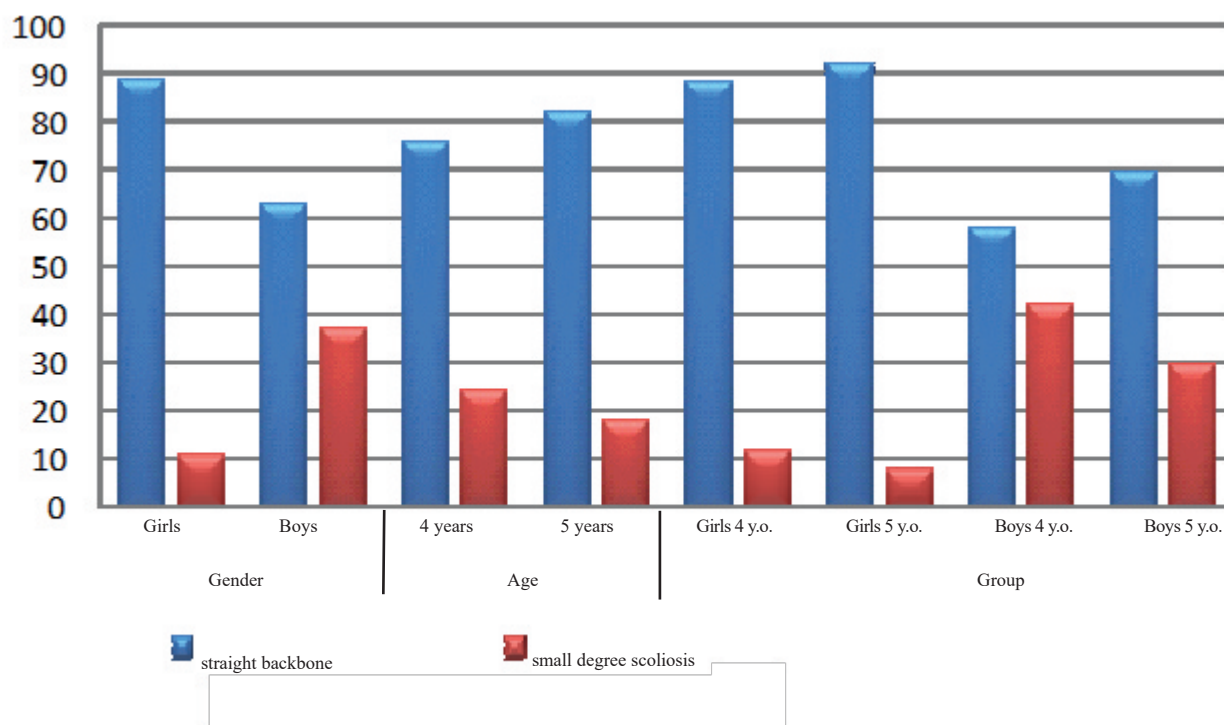


Fig. 13. The evaluation results of lateral spine curvature depending on gender and age

There was no significant relationship ( $p = 0.0673$ ) of the evaluation results of lateral spine curvature depending on gender. There was no significant relationship ( $p = 0.9338$ ) of the assessment results of lateral spine curvature depending on age. There was no significant relationship ( $p = 0.1588$ ) of the evaluation results of lateral spine curvature depending on the group in terms of gender and age. The comparison of the results of girls aged 4 and 5 showed a negligible ( $p = 0.6876$ ) correlation, similar in the comparison between boys aged 4 and 5 years where the relationship was also insignificant ( $p = 0.9034$ ). 78% of the children have a straight backbone, and 22% represent children with scoliosis of a small degree.

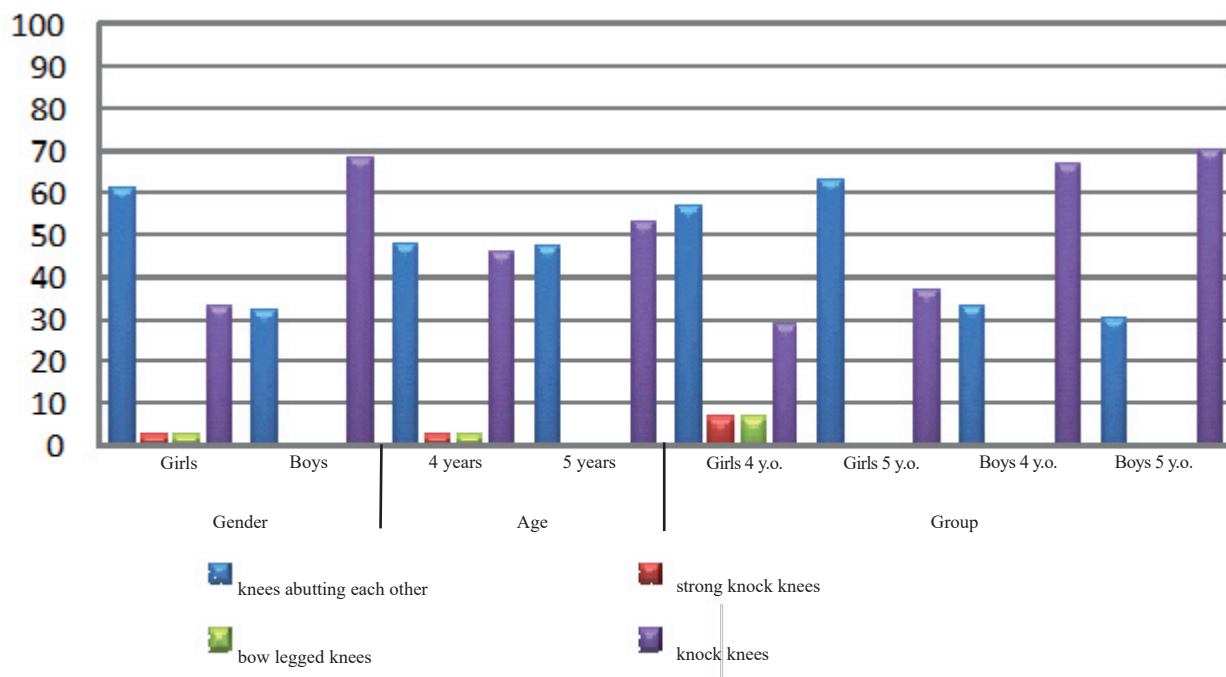


Fig. 14. The assessment results of knees setting depending on gender and age

There was no significant relationship ( $p = 0.0704$ ) of the assessment results of knees setting depending on gender ( $p = 0.6607$ ). There was no significant relationship ( $p = 0.0704$ ) of the assessment results of knees setting depending on age. There was no significant correlation ( $p = 0.3939$ ) of the assessment results of knees setting depending on the group in terms of sex and age. The comparison of the results of girls aged 4 and 5 showed a negligible ( $p = 0.7008$ ) correlation, similar to the comparison between boys aged 4 and 5 years where the relationship was also insignificant ( $p = 0.7699$ ). 48% of the subjects have straight lower limbs, knees and heels abutting each other, and 48% have knock knees, medial ankles spaced more than 1 cm apart, and 2% of the subjects have strongly knock knees, the medial ankle spacing more than 3 cm and the bow-legged knees are not adjacent to each other (spacing more than 1 cm).



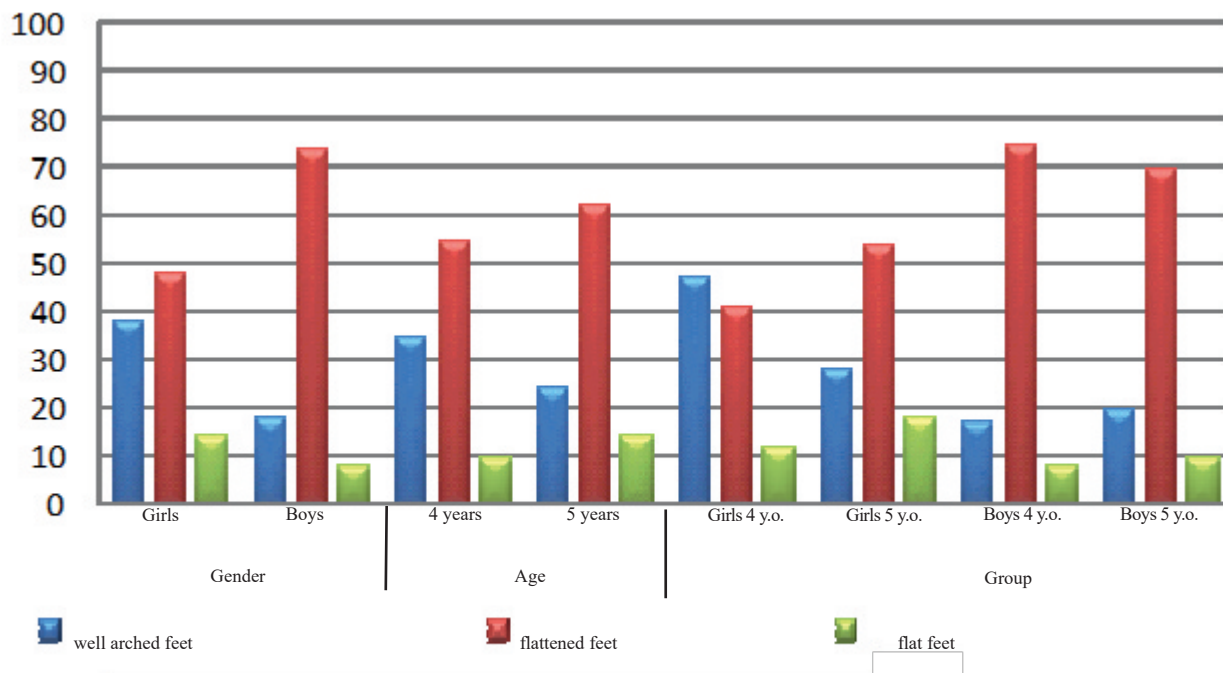


Fig. 15. The evaluation results of feet arching depending on gender and age

There was no significant relationship ( $p = 0.1674$ ) of the evaluation results of feet setting according to gender. There was no significant correlation ( $p = 0.6993$ ) of the evaluation results of feet setting depending on age. There was no significant relationship ( $p = 0.5518$ ) of the evaluation results of feet setting depending on the group in terms of gender and age. The comparison of the results of girls aged 4 and 5 showed a negligible ( $p = 0.5726$ ) correlation, similar to the comparison of boys aged 4 and 5 years where the relationship was also insignificant ( $p = 0.9662$ ). The 30% of children surveyed have well arched feet and 58% have flattened feet while 12% have flat feet.

### Discussion

Deficiencies in body posture are increasingly diagnosed among children. Long-term observations of body posture indicate that the main cause of their development is an inadequate lifestyle [3]. Additionally, there is a lack of physical activity leading to excess weight and obesity. The widespread use of computers and the Internet has made children and young people more willing to spend free time in front of the monitor than in the open air. The defects of body posture manifest themselves first of all by changing the setting of particular body parts in relation to one another, causing subsequent pain and impairment of vital functions. This leads to a lower quality of life for children, being not only a medical but also a social problem. Previous studies indicate that the number of children with postural defects is steadily increasing, so it is important to find a way to prevent these dysfunctions [14]. The analyzes of personal research and literature are consistent, the most

common defects are concave back, flat back, scoliosis and flat feet [15]. Disturbing symptoms include limitation of mobility of large joints, especially hip joints caused by muscle contractures. In studies by Grażyna Kempys et al., conducted in 2003/2004 and 2004/2005, a total number of 102 children were examined. The contracture of the ilio-lumbar muscle was found in 24 out of 53 participants in corrective gymnastics in 2003/2004. In the following year, it was observed in 26 children out of 49 participating in the class. The least favorable outcome was found in the study of sciatic and shin muscles – 31/ 53 (58%) participants in one year and 39/49 (80%) in the following year had contractures of these muscle groups [15]. Personal research show that 21 out of 50 patients suffer from the iliac-lumbar muscle contracture and 20 out of 50 patients experience sciatic-shin muscle contractures. In studies conducted by Jakub Pokrywka et al. in the Department of Biostructure of the Tissues of the Academy of Physical Education in Wrocław in primary schools, in the group of 1527 children in 2002 and 871 children in 2008, it was shown that free time spent watching TV and doing computer activities was extended both among boys and girls [16]. Mazur et al. confirm these findings [17]. It is important to note how much the model of leisure time has changed among children. This is a disturbing fact, which certainly leads to impaired structure of the developing child's organism. The studies of the Academy of Physical Education in Wrocław conducted in 2002 and 2008, act as a confirmation of earlier observations, indicating a steady increase in the percentage of children with postural defects [16]. Katarzyna Maciołczyk-Paprocka et al. conducted a study of children aged 3-6, attending kindergartens in Poznań. 425 children were examined, 51% boys and 49% girls. The study was carried out using a visual method according to posture disorders table based on the modified criteria of Wiktor Dega [14].

No disorder was found in 18.1% of children, 15.1% of them were boys and 21.4% girls. Head posture disorders were reported in 9.6% of children, while disorders in the setting of shoulders in 41.1% of the respondents. Pigeon chest was found among 7.8% of the participants, while 4.6% of the subjects had pectus excavatum. Kifotic posture was found in 9.6%, scoliosis in 24.7% and lordotic in 4.1%. 2.7% of children had bow-leggedness and 29.2% had knock knees, which is acceptable at this age. 51.1% of respondents reported flat feet. The highest standard deviations were found within the shoulders, knees and feet. Studies have shown that the amount of contractures in the hip and shoulder girdle is increasing with age. Boys aged three and girls at the age of four are a group of children with the biggest number of correct postures[14]. Kasperczyk's posture studies have been conducted in Primary School in Strzelce, where 60 children aged 7-11 have been examined [18]. 8% of children had abnormalities in head position in the form of a slightly forward head, 38% had shoulders slightly forward, 63% had shoulder blades away from the back plane. In 12% of the subjects, shoemaker's chest defect was observed, 6% suffered from pigeon chest defect. 20% of children had enlarged chest kyphosis, while 27% had a decrease in chest kyphosis. As for the lumbar lordosis,

15% of the subjects had it slightly enlarged., Scoliosis of various degrees has been reported in 27% of children. Bow-leggedness was found in 15% of children and knock knees in 23% of children. 10% of subjects had flattened feet, 1% flat, and 7% flat knock-kneed. Personal studies were conducted on a group of four-year-old and five-year-old children. 50 children were examined, 28 girls and 22 boys. Analyzing these results, many lordotic postures have been found, which is characteristic of this period of ontogenetic development. There are no significant differences in body structure between male and female, but a large difference in body weight and growth between four and five year olds has been observed. The results indicate that five-year-olds are taller than four-year-olds, and there is a significantly big difference between four-year-old girl and five-year-old boys. It has also been shown that five-year-olds have a higher body weight than four-year-olds. A big difference was observed between five-year-old girls and four-year-old boys. In Lovette's test of the large buttock muscle and simple abdominal muscles, there was slightly increased muscle power in children aged five. In a body posture study according to Kasperczyk's protocol it was found that 16% of the subjects had a misaligned head, 50% of the children had shoulders slightly forward, and 72% had shoulder blades protruding from the back plane. A flattened chest was found in 18% of children. 90% of children have an orbital abdomen, which is, however, acceptable for pre-school children, and is explained by an increased lumbar lordosis (found in 62% of children). 50% of children had knock knees, which is also not a serious problem among young children.

The analysis of personal research findings, as well as those of other authors', indicates the necessity of constant monitoring of somatic development of children and adolescents. It will allow on-going monitoring of the physiological course of ontogenetic development, and in case of its danger, undertaking early preventive and curative activities. It is also important to perform screening tests of the body posture in pre-school and school institutions. The results of these studies also point to the need for continual health education and health promotion, not only among children, but primarily among parents, teachers, educators, whose knowledge, commitment, but also their own, good example affects health of the young generation.

### Conclusions

1. The body posture of pre-school children manifests a great individual variety.
2. Lordotic posture types and knee valgus frequently observed among pre-school children are variants of the ontogenetic development standard.
3. The results of Lovette's test indicate a good or even very good condition of muscle strength in terms of the buttocks and abdominal muscles.
4. Test results of Dega, Thomas and pseudo-Laseque's test show the frequent occurrence of muscle spasm in the shoulder and hip girdle.
5. Among 4/5-year-old children, abnormal (flattened or flat) foot arch is often observed.



6. The presence of a large number of postural abnormalities among pre-school children indicates the need to undertake early medicinal and corrective measures to avoid postural defects in later life.

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## References

1. Kędra A., Częstość występowania bólów kręgosłupa, a sposób spędzania wolnego czasu wśród dziewcząt wiejskich, *Nowa Pediatria*, 2006, 4, 90-94.
2. Chlebna-Sokół D., Kardas-Sobantka D., Ligenza I., Haładaj K., Malinowski A., Rozwój dzieci w wieku przedszkolnym. W: Dziecko łódzkie. Metody badań i normy rozwoju biologicznego. Red. Malinowski A., Chlebna-Sokół D., Wyd. Anka, Łódź 1988.
3. Dziak A., Bóle krzyża, PZWL, Warszawa 1984.
4. Kasperczyk T., Wady postawy ciała-diagnostyka i leczenie, KASPER, Kraków 2004.
5. Tecklin J. S., Fizjoterapia Pediatryczna, PZWL, Warszawa 2004.
6. Dega W., Ortopedia i rehabilitacja, PZWL, Warszawa 2000.
7. Siarkiewicz J., Karolczak M., Profilaktyka najczęstszych wad wrodzonych i rozwojowych narządu ruchu u dzieci, *Nowa Pediatria* 2006, 4, 82-85.
8. Borkowska M., Gellea-Mac I., Wady postawy i stóp u dzieci, PZWL, Warszawa 2004.
9. Skolimowski T., Badanie czynnościowe narządu ruchu w fizjoterapii, AWF Wrocław 2009.
10. Nowotny J., Saulicz E., Niektóre zaburzenia statyki ciała i ich korekcja, AWF Katowice 1990.
11. Wilczyński J., Korekcja wad postawy człowieka, Antrophos, Starachowice 2005.
12. Wlazłowski J., Chlebna-Sokół D., Ligenza I., Ocena stanu zdrowia dzieci w wieku od 6 miesięcy do 5,5 lat. W: Stan zdrowia dzieci uczęszczających do żłobków, 56-61, Wyd. Anka, Łódź 2001.
13. Wolański N., Metody kontroli i normy rozwoju dzieci i młodzieży, PZWL, Warszawa 1995.
14. Maciałyk-Paprocka K., Krzyżaniak A., Kotwicki T., Kałużny Ł., Przybylski J., Postawa ciała dzieci w wieku przedszkolnym, *Probl. Higien. Epidemiol.* 2011, 92(2), 286-290.
15. Kempys G., Kowalska E., Nabielska J., Wady postawy ciała dzieci w wieku przedszkolnym i wczesnoszkolnym, [www.gkk.pl](http://www.gkk.pl).
16. Pokrywka J., Figiel J., Połuszny P., Częstość wad postawy ciała u dzieci z Zagłębia Miedziowego, *Fizjoterapia* 2011, 19(4), 3-10.
17. Mazur J., Woynarowska B., Kołała H., Zdrowie subiektywne, styl życia i środowisko psychospołeczne młodzieży szkolnej w Polsce, Raport techniczny z badań HBSC 2006, Instytut Matki i Dziecka, Zakład Epidemiologii, Warszawa 2007.
18. Badanie wad postawy ciała, [www.spstrzelce.edupage.org](http://www.spstrzelce.edupage.org).