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## Sukces czy porażka? Czyli jak wygląda sytuacja w zakresie szczepień ochronnych w Polsce?

Cztery uczelnie – Centrum Medyczne Kształcenia Podyplomowego, Warszawski Uniwersytet Medyczny, Akademia Leona Koźmińskiego i Uniwersytet SWPS zorganizowały konferencję naukową w ramach Projektu „Budowanie zaufania do szczepień ochronnych z wykorzystaniem najnowszych narzędzi komunikacji i wpływu społecznego”.
Podczas czterech paneli dyskusyjnych eksperci, naukowcy, lekarze, psycholodzy, przedstawiciele instytucji publicznych dyskutowali na temat szans i wyzwań stojących przed system szczepień w Polsce.

Nie da się zaprzeczyć faktom – szczepienia ochronne są najefektywniejszą metodą zwalczania chorób zakaźnych. Podnoszenie zaufania do szczepień, które przekłada się na poziom wyszczepienia populacji, jest więc kluczowym wyzwaniem stojącym przed wszystkim odpowiedzialnymi za zdrowie publiczne w Polsce.

Dużym sukcesem i krokiem w dobrym kierunku było wprowadzenie szczepień w aptekach – podkreślił prof. Jarosław Pinkas, Konsultant Krajowy w dziedzinie zdrowia publicznego.

Niemniej, mimo szeroko prowadzonej kampanii medialnej, Polska należy do krajów o najniższym poziomie wszczepienia przeciw COVID-19 w Europie (niespełna 60% populacji zostało w pełni zaszczepionych). Co roku w naszym kraju przeciw wirusowi grypy szczepi się jedynie 4-6% osób. Według danych PZH-NIPZ liczba uchyleń od szczepień obowiązkowych wśród dzieci w okresie od 2016 do 2020 roku wzrosła 2-krotnie z 23 tys. do 50.5 tys.

„Szczepienia przeciwko grypie u pracodawców bardzo zmniejszają absencję w pracy, ta sama prawidłowość dotyczy szczepień rotawirusowych” – mówił prof. Marcin Czech

Z danych uzyskanych przez Warszawski Uniwersytet Medyczny wynika, że postawy mieszkańców Polski wobec szczepień nie są spójne. Może to w przyszłości spowodować dalszy spadek poziomu wyszepienia populacji, a w dalszej perspektywie wzrost zagrożenia epidemiologicznego.

W ramach panelu prowadzonego przez Uniwersytet SWPS zastanawiano się nad przyczynami postaw wobec szczepień. Pierwszym skojarzeniem, jakie większość Polaków wypowiada po haśle „szczepienia” jest „koronawirus”. I choć rzeczywiście od końca 2020 roku szczepienia przeciwko COVID-19 stały się jednym z bardzo ważnych elementów debaty publicznej, to przecież rosnąca liczba osób uchylających się od szczepień na takie choroby jak odra czy krztusiec była ważną kwestią społeczną już przed marcem 2020 roku.

Jednym z kluczowych wyzwań stojących przed system szczepień w Polsce jest walka z fake newsami, podkreślali eksperci Akademii Leona Koźmińskiego.
Czy dezinformację naukową można interpretować w kategoriach cyberwojny?
Czy jest to zagrożenie porównywalne z katastrofą klimatyczną, bądź rozwojem technik AI? Jaką rolę odgrywają w tym procesie media społecznościowe? To pytania z którymi musimy się jak najszybciej zmierzyć.

Mimo wszystko wysoka wyszczepialność w Polsce to sukces wszystkich profesjonalistów medycznych i osób działających na rzecz zdrowia publicznego. Wciąż zdecydowana większość Polaków dokonuje właściwych wyborów zdrowotnych. To optymistyczny wniosek płynący z konferencji CMKP, WUM, SWPS i ALK. Jednak nic nie jest dane raz na zawsze – pojawiające się wyzwania powinny mobilizować lekarzy, naukowców, edukatorów, przedstawicieli administracji publicznej do szukania nowych sposobów dotarcia z komunikatem zachęcającym do szczepień i podejmowania zdecydowanych działań na rzecz walki z dezinformacją.

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# The direction of primary lateral spinal curvature and distribution of body mass on base of support in children with scoliosis I°

*Kierunek pierwotnego skrzywienia kręgosłupa a rozkład sił nacisku mas ciała na płaszczyźnie podparcia u dzieci ze skoliozą I°*

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**Abstract**

Introduction. As a result of subjective functional assessment, disturbances in the symmetry of body weight distribution on the support plane are commonly observed in children and adolescents with idiopathic scoliosis. The objective of this study was to identify the relationship between the direction of the primary curvature and the body weight distribution on the ground in children with idiopathic scoliosis.

Method. Two groups (the study group and the control group) of children aged 7–11 were included in the study. The study group consisted of 96 children rehabilitated due to scoliosis in rehabilitation centres. The control group included children of the corresponding age, height and weight in comparison to the study group. The main element of the study involved measurements of the percentage body weight distribution on the support plane between the "convex" and "concave" side of the body while maintaining a standing position on both legs.

Results. Based on the value of the symmetry index and the direction of the primary curvature, the following subgroups were distinguished among the children with scoliosis: children with symmetrical body weight distribution on the support plane (21%); children with asymmetric body weight distribution on the support plane overloading the convex side (51%) and children overloading the concave side (28%).

Conclusion. The occurrence of symmetry disorders in the body weight distribution on the support plane in children with idiopathic scoliosis requires taking these features into account in the early stage of rehabilitation of these children.

**Key words:**

scoliosis, compensating postural patterns, distribution of body mass on the surface

**Streszczenie**

Wprowadzenie. W wyniku subiektywnej oceny funkcjonalnej u dzieci i młodzieży ze skoliozą idiopatyczną powszechnie obserwuje się zaburzenia symetrii rozkładu masy ciała na płaszczyznę podporu. Celem niniejszego opracowania było rozpoznanie związku pomiędzy kierunkiem skrzywienia pierwotnego a rozkładem sił nacisku mas ciała na podłoże u dzieci ze skoliozą idiopatyczną.

Metoda. Badaniami objęto dwie grupy (grupę badaną i kontrolną) dzieci w wieku 7–11 lat. Grupę badaną stanowiło 96 dzieci usprawnianych z powodu skoliozy w ośrodkach rehabilitacyjnych. Do grupy kontrolnej zakwalifikowano dzieci odpowiadające wiekiem, wzrostem i masą ciała uczestnikom z grupy badanej. Zasadniczym elementem przeprowadzonych badań były pomiary procentowego rozkładu sił nacisku masy ciała na płaszczyznę podparcia pomiędzy „wypukłą" i „wklęsłą" stroną ciała podczas samodzielnego utrzymywania pozycji stojącej obunóż.

Wyniki. Na podstawie wartości wskaźnika symetrii oraz kierunku skrzywienia pierwotnego wśród badanych dzieci ze skoliozą wyróżniono następujące podgrupy: dzieci z symetrycznym rozkładem masy ciała na płaszczyznę podporu (21%); dzieci z asymetrycznym rozkładem masy ciała na płaszczyznę podporu przeciążające stronę wypukłą (51%) oraz dzieci przeciążające stronę wklęsłą (28%).

Wniosek. Występowanie zaburzeń symetrii rozkładu sił nacisku masy ciała na płaszczyznę podporu u dzieci ze skoliozą idiopatyczną wymaga uwzględnienia tych cech we wczesnym etapie rehabilitacji tych dzieci.

**Słowa kluczowe:**

skolioza, kompensacyjne wzorce posturalne, rozkład masy ciała na płaszczyźnie podparcia


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## Introduction

Idiopathic scoliosis (IS), i.e. scoliosis of undetermined aetiology, is defined as a three-dimensional structural deformity of the spine developing simultaneously in three planes, consisting of a lateral curvature of the spine exceeding 10°, disturbances in the physiological thoracic kyphosis and in the lumbar lordosis in the sagittal plane as well as axial rotation of the vertebrae in the transverse plane [1]. The external expression of the deformity of the spine is also the costal hump affecting the thoracic spine, and the lumbar prominence affecting the lumbar spine. Scoliosis also distorts other body segments, such as the thorax, shoulders, pelvis, and internal organs. These are the so-called secondary and tertiary changes [2].

In the literature on the subject, various divisions of scoliosis are presented, depending on the aetiology, location or size of the spine deformation. Among idiopathic scoliosis, according to the classification recommended by the Scoliosis Research Society, the following types of scoliosis are distinguished: 1) infantile (diagnosed from birth to 3 years of age); 2) subsiding, 3) progressing, 4) juvenile (diagnosed between 3 and 10 years of age); adolescent (diagnosed over 10 years of age) [1].

Although scoliosis is most often located in the thoracic spine or between the thoracic and lumbar sections, due to the location of the primary curvature arch and the apical vertebrae of the scoliosis, we can distinguish the following types of scoliosis: 1) cervical; 2) cervico-thoracic; 3) thoracic; 4) thoracic-lumbar and 5) lumbosacral (apical vertebra $L_5$ and $S_1$) [3]. In recent decades, new classifications of scoliosis have also been presented, e.g. the King-Moe classification, which distinguishes 5 types of scoliosis according to their natural development, prognosis and treatment: 1) type I – S-shaped scoliosis (curve in the lumbar spine is greater than in the thoracic spine), 2) type II – S-shaped scoliosis (curve in the thoracic spine is greater than in the lumbar spine); 3) type III – thoracic scoliosis; 4) type IV – long thoracic curve; 5) type V – double curve in the thoracic spine [6].

Despite the fact that the causes of scoliosis are - as the name suggests – idiopathic, i.e. unknown, it is assumed that many factors are involved in the aetiology of scoliosis [7]. There seems to be a relationship between the onset of scoliosis and the growth and development of the child, hormone release, posture and physical activity [7, 8]. Some sources link the development of scoliosis with the impairment of central mechanisms responsible for managing the integration of visual, proprioceptive and vestibular data in the process of regulating the vertical position, and thus postural stability [9]. The results of other studies suggest a significant role of vitamin $D_3$ deficiency and low bone mass in the development of scoliosis [8, 9].

As a result of subjective functional assessment appropriate in medical and physiotherapeutic practice (i.e. podoscopic assessment), disturbances in the symmetry of body weight distribution on the support plane are commonly observed in children and adolescents with scoliosis. However, they are confirmed only by a few research results [10, 11, 12]. While the results are promising, they included only girls with idiopathic mild thoracic right-sided scoliosis [10] or case studies [11]. None of the studies conducted so far have comprehensively assessed


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postural control in children with scoliosis. The undertaken study is part of a larger research project called "Postural control in children with scoliosis" and involves the assessment of the body weight distribution on the ground.

The main objective of the first stage of this project, carried out as part of this study, was to identify the relationship between the direction of the primary curvature and the static body weight distribution on the ground in children with idiopathic scoliosis. A research hypothesis was made that the direction of the primary curvature is consistent with the direction of excessive load on the side of the body on which the scoliosis convexity occurs, i.e. the thesis concerning the consistency of the direction of the primary curvature and the direction of overload on the side of the body.

## Material and method

The design of this study was approved by the Bioethics Committee of the Medical University of Katowice, Poland. All parents or legal guardians signed an informed consent to the child's participation in the study.

### Material

Two groups (the study group and the control group) of children aged 7–11 were included in the study. The study group consisted of children rehabilitated due to scoliosis in rehabilitation centres. The inclusion criteria were as follows: 1) diagnosed and clinically confirmed scoliosis; 2) the primary curvature angle greater than 10° but less than 25° according to Cobb; 3) age between 7–11; 4) the ability to understand and follow instructions; 5) informed consent of the child's parents or legal guardians to participate in the study. The study group consisted of 100 children who met the inclusion criterion. Four participants did not provide an X-ray and were not included in the data analysis. Finally, the study group was represented by 96 participants. The second group, i.e. the control group, included children aged 7–11, of the corresponding age, height and weight in comparison to the study group. These were children with variously severe posture disorders, which included: asymmetry of the shoulders and/or shoulder blades, knee defects (valgus, varus) and foot defects (flatfoot, planovalgus). The exclusion criteria for both groups included other acute and chronic diseases in addition to scoliosis.

### Method

The main element of the study involved measurements of the percentage body weight distribution on the support plane between the right and left sides while maintaining a free standing position on both legs. The above parameters were measured using a baroresistive platform (ZEBRIS' PDM with FootPrint software) during a 30-second attempt to hold a specific position. Each measurement was performed three times. Average values of three measurements at each position were selected for statistical calculations.

### Statistical elaboration

The results obtained from the above assessments were statistically analysed by comparing the mean values of the parameters obtained in each group with the Student's t-test using Statistica 7.0.


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The normality of the data distribution was verified by the Shapiro-Wilk test. Data was presented in the form of mean values and standard deviation as well as coefficient of variation or median and quarter deviation, depending on the evaluation of the data distribution. Differences between the groups and subgroups were assessed using one-way analysis of variance (ANOVA). The multiple comparison test with the Bonferroni correction was used for the post-hoc evaluation. Differences between the study and control groups were analysed using the t-test for unrelated variables. The significance level $\alpha = 0.05$ was adopted in the analyses.

For the purposes of statistical analysis, the direction of the primary curvature was determined for each participant in accordance with the direction of the scoliosis convexity. The results of the percentage body weight distribution on the support plane between the sides of the body are presented in relation to the so-called convex and concave side of the scoliosis, replacing the division into the left and right sides of the body. The basis for such differentiation was the measurement of the load while maintaining a free standing position with eyes open. The measurement result was expressed as a percentage of the total body weight to one decimal place. People with a symmetrical distribution (50% on each limb) were defined as symmetrical. Based on the associated results: direction of scoliosis and direction of overload, the following subgroups of participants were distinguished among the subjects with:

1) left-sided scoliosis, overload of the right side (concave); (LP)
2) right-sided scoliosis, overload of the left side (concave); (PL)
3) left-sided scoliosis, overload of the left side (convex) (LL)
4) right-sided scoliosis, overload of the right side (convex) (PP).

In the next step, left-sided scoliosis with overload of the right (concave) side (LP) and right-sided scoliosis with overload of the left (concave) side (PL) were classified as scoliosis with overload of the concave side (WK), while left-sided scoliosis with overload of the left (convex) side (LL) and right-sided scoliosis with overload of the right (convex) side (PP) as scoliosis with overload of the convex side (WP).

In addition, the type of scoliosis was determined among the study group in accordance with the King-Moa classification, distinguishing:

• type I – double S-shaped curve, both scoliosis arches cross the central sacral line. The curve in the lumbar spine is greater than the curve in the thoracic spine. The curve covers the lumbar region from $Th_{11}$ or $Th_{12}$ to $L_4$ or $L_5$, the apex of the curve is usually located on L2 and the thoracic section from $Th_4$ or $Th_5$ to $Th_{12}$ or $L_1$ with the apex situated on $Th_6$ or $Th_7$;

• type II – double S-shaped curve, both scoliosis arches cross the central sacral line. The curve in the thoracic spine is greater than the curve in the lumbar spine. The thoracic curve is usually on the left side. Its range covers the section from $Th_1$ or $Th_2$ to $Th_{11}$ or $Th_{12}$. The apex of the curve is usually on $Th_6$ or $Th_9$. Lumbar curve $Th_{11}$ or $Th_{12}$ to $L_4$ or $L_5$. The apex is situated on $L_1$ or $L_2$;

• type III – thoracic curve, where the arch of the lumbar curve does not exceed the central sacral line. The curve is usually on


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the right side. The range covers the thoracic section from $Th_6$ to $Th_{11}$. The apex of the curve is on $Th_6$ or $Th_9$;
• type IV – long thoracic scoliosis where $L_4$ and $L_5$ are positioned horizontally above the sacrum, and $L_4$ is tilted towards the thoracic scoliosis. This curve covers the thoracic spine from $Th_6$ or $Th_7$ to $L_1$ or $L_2$. The apex is usually situated on $Th_{11}$ or $Th_{12}$;
• type V – double thoracic scoliosis of the spine with T1 leaning towards the concavity of the upper curve.
Central sacral line – CSL is a line drawn through the centre of the sacrum and perpendicular to the line running along the upper edge of the surface of the wings of ilium.

## Results

The characteristics of the study and control groups are presented in Table 1. The participants from the study and control groups did not differ from each other in terms of basic anthropometric features (Table 1).

**Table 1. Characteristics of the study and control group**

| Parameter | Study group (N = 96) | | Control group (N = 50) | | t | p |
|---|---|---|---|---|---|---|
| Age (years), M ± SD; min-max | 9.5 ± 21 | 7–13 | 9.3 ± 2,0 | 7–13 | 0.98 | 0.34 |
| Height (cm), M ± SD; min-max | 133 ± 12 | 101–160 | 131 ± 12 | 112–155 | 0.07 | 0.93 |
| Body weight (kg), M ± SD; min-max | 33.2 ± 10.8 | 18–61 | 32.4 ± 9.23 | 19–52 | 0.62 | 0.32 |
| BMI (kg/m2), M ± SD; min-max | 17.9 ± 3.1 | 13.227.3 | 18.1 ± 2.7 | 13.4–24.7 | 0.07 | 0.87 |
| **Sex, N; %:** | | | | | | |
| Girls | 56 | 58% | 27 | 54% | | |
| Boys | 40 | 42% | 23 | 46% | | |

*M – mean values; SD – standard deviation; t – t-Student's value; p – statistical significance*

In the study group, the most common was long thoracic scoliosis (type IV; 29%), then in approx. 1/4 of the respondents a double sigmoid curve with the primary lumbar curvature (type I; 27%) and a double S-shaped curve with the primary thoracic curvature (type II; 26%) were observed – Figure 1.

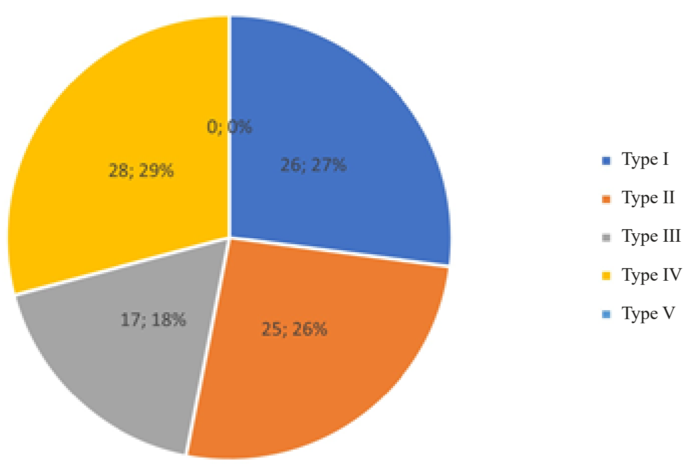


**Figure 1. Percentage distribution in terms of the type of scoliosis according to King-Moa**


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The distribution of body weight on the support plane between the sides of the body (right and left) was expressed by the testing device as a percentage of the full body weight divided into the "convex" and "concave" side (100% in total). The symmetry index (IS) was used to assess load symmetry, obtained from the formula IS = QWP - QWK, where QWP is the percentage load on the convex side, and QWP is the percentage load on the concave side of the body. The closer the value of the IS index was to "0", the smaller the asymmetry of the body weight distribution on the support plane between the sides of the body. The mean value of the asymmetry index, i.e. the difference between the load on the body on the side of the convexity and the concavity of the curve in absolute values, was almost 20% in children with scoliosis, while the value of this index in the control group was only 6% (Table 2). Comparing the IS values between the study group and the control group, a statistically significant difference was obtained (Table 2).

**Table 2. Symmetry index (IS) in the study and control group**

| Parameter | Study group (N = 96) | | Control group (N = 50) | | t | p |
|---|---|---|---|---|---|---|
| | M ± SD | min-max | M ± SD | min-max | | |
| IS (%) | 9.5 ± 21 | 133 ± 12 | 33.2 ± 10.8 | 17.9 ± 3.1 | 8.4 | 0.000 |

*M – mean values; SD – standard deviation; t – t-Student's value; p – statistical significance*

On the basis of the IS index, the mean values and standard deviation were distinguished among children from the control group. Then, as the cut-off point for the apparent asymmetry, the value based on the calculation of the Z standardized results was taken and the observations that deviated by 95% from the normal distribution were cut off. As the control group is characterized by the following statistics: 6.2 ± SD 3.1%, the cut-off criterion for the study group was calculated on the basis of the following formula: $Z = (X - \mu) / \sigma$. Therefore, all values above 11.5% were used as the cut-off point.

Based on the value of the symmetry index and the direction of the primary curvature, the following subgroups were distinguished among the children with scoliosis (N = 96; 100%):

- S – children with symmetrical body weight distribution on the support plane (N = 20; 21%);
- WP – children with asymmetric body weight distribution on the support plane overloading the convex side (LL + PP) (N = 49; 51%);
- WK – children with asymmetric body weight distribution on the support plane overloading the concave side (LP + PL) (N=27; 28%).


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**Table 3. The symmetry index (IS) and the value of the Cobb angle in individual subgroups**

| Parameter | S (N = 20) | | WP (N = 49) | | WK (N = 27) | |
|---|---|---|---|---|---|---|
| | M ± SD | min-max | M ± SD | min-max | M ± SD | min-max |
| IS (%) | 6.2 ± 3.1 | 2–10 | 22.3 ± 9.1 | 12–48 | 22.9 ± 10,0 | 10–46 |
| Cobb angle (˚) | 16.9 ± 4.1 | 10–24 | 19.4 ± 6,4 | 10–37 | 19.0 ± 6,7 | 11–34 |

*M – mean values; SD – standard deviation; t –t-Student's value; p – statistical significance. S – children with symmetrical body weight distribution on the support plane; WP – children with asymmetric body weight distribution on the support plane overloading the convex side; WK – children with asymmetric body weight distribution on the support plane overloading the concave side*

Based on the comparative analysis, apart from significant differences in the value of the asymmetry index between the subgroups of children with symmetric and asymmetric body weight distribution on the support plane, no statistically significant differences were found in terms of the primary curvature angle. There were also no significant differences in terms of the asymmetry index and the curvature angle between the children overloading the convex and concave side of the body (Figure 2).

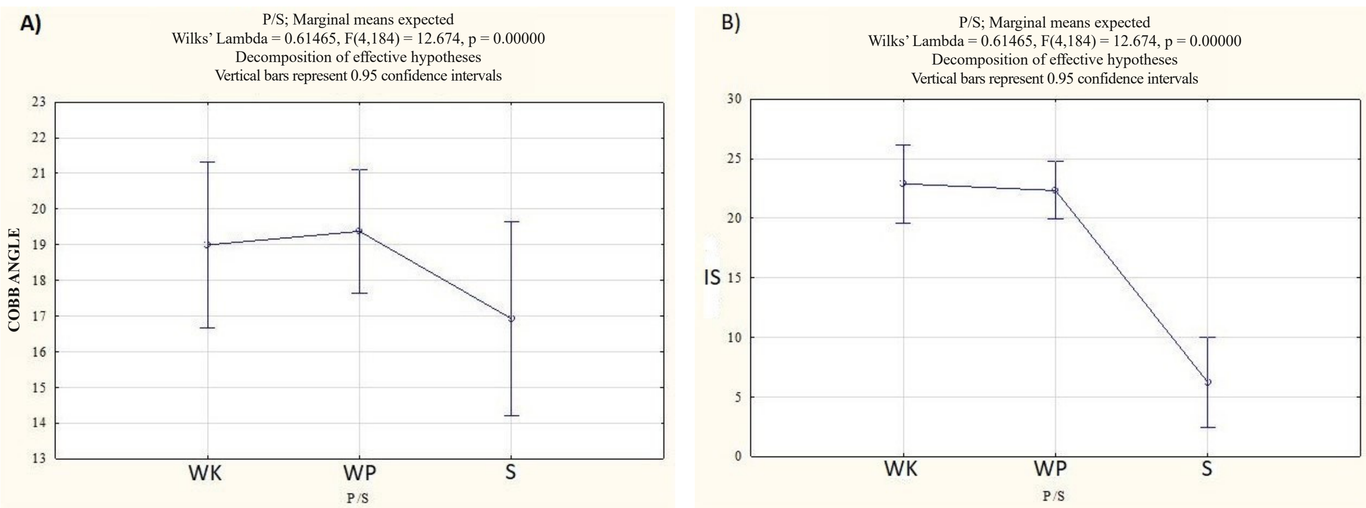


**Figure 2. Comparison of the value of the Cobb angle (A) and the value of the asymmetry index (B)**

*S – children with symmetrical body weight distribution on the support plane; WP – children with asymmetric body weight distribution on the support plane overloading the convex side; WK – children with asymmetric body weight distribution on the support plane overloading the concave side*

When analysing the distribution in terms of the asymmetry of loading each side of the body, taking into account the type of scoliosis according to King-Moa, it was observed that in each type there were people who fell within the broad norm of symmetry of loading each side of the body. Most of the participants, as many as 40%, had a double S-shaped curve with the primary thoracic curvature (type II), slightly less, i.e. 30%, were children with long thoracic scoliosis (type IV), then 20% had type I scoliosis, and the remaining 10% type III scoliosis. It is true that more participants in all types of scoliosis overloaded the so-called convex side of the body, but this was especially true of subjects with long thoracic scoliosis - 78%; type IV (figure 3). Among the participants qualified for thoracic scoliosis, i.e. double scoliosis with the primary thoracic curvature (type II) and thoracic scoliosis (type III), overloading of the concave side was not observed at all or rarely


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(Figure 3). Interestingly, 78% of the participants with long thoracic scoliosis overloaded the concave side of the body (Figure 3).

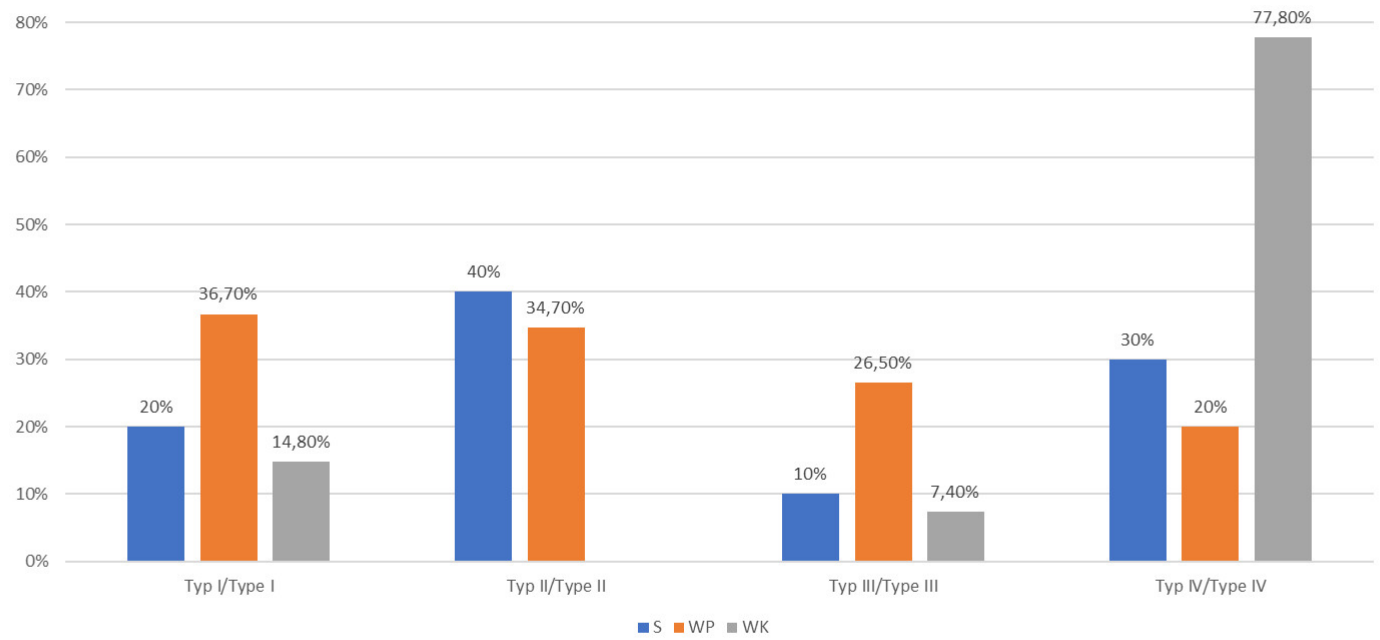


**Figure 3. Percentage distribution in terms of asymmetry of loading on the sides of the body, taking into account the type of scoliosis according to King-Moa**

*S – children with symmetrical body weight distribution on the support plane; WP – children with asymmetric body weight distribution on the support plane overloading the convex side; WK – children with asymmetric body weight distribution on the support plane overloading the concave side*

## Discussion

The assumption of this project was to identify the relationship between the direction of the primary curvature and the static body weight distribution on the ground in children with IS. For this purpose, the direction of the primary curvature was determined in children with IS, and the results of the percentage of body weight distribution on the support plane between the sides of the body were presented in relation to the convex and concave sides of the curvature, replacing the division into the left and right sides of the body. Such an approach to the analysed problem allowed for the distinction of children with an asymmetric body weight distribution on the support plane overloading the convex side of the body and children overloading the convex side. On the other hand, the use of the average results of the body weight distribution on the ground among the peers from the control group allowed for the determination of the boundary values of the broad norm of symmetry of the body weight distribution between the sides of the body in the healthy population of children. The value of the asymmetry index was 11%. On this basis, in the study group some children with scoliosis were distinguished, who, like their healthy peers, symmetrically distributed loads between the convex and concave side of the body. At the same time, the results obtained here undermined the assumption of full symmetry of body weight distribution between the sides of the body in healthy children (50% to 50% +/− 5%), often used as a reference to the


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results of body weight distribution in various populations used in previous studies, including also among children with IS [14].
Although the hypothesis made at the beginning on the compliance of the direction of the primary curvature and the direction of overload, i.e. overloading the convex side of the body in children with IS, was based both on the common belief and on scientific reports [15], the results obtained in the analysis did not allowed for its confirmation. Because although the subgroup of children overloading the convex side of the body comprised of more than half of the study population (51%), among the remaining half of the participants, there were children overloading the concave side (28%) and children with symmetrical body weight distribution on the support plane (21%). In addition, no significant differences were observed between the children overloading the convex or concave side of the body, neither in the size of the load asymmetry nor in the value of the Cobb angle. However, the size of the asymmetries in the body weight distribution on the support plane between the convex and concave side of the body (on average over 20%, and a maximum of 48%) was astonishing.
The analysis of the body weight distribution on the support plane between the convex and concave side of the body in particular types of scoliosis classified according to King-Moa was also interesting. Among the participants with long thoracic scoliosis, overloading of the convex side of the body was only sporadically observed, and almost 80% of participants with this type of scoliosis overloaded the concave side of the body. Considering the length of the scoliosis arch and the lack of compensation curvature of this scoliosis, this result seems completely justified. Due to the lack of similar studies in the literature on the subject, it is not possible to confront our results with the results of other studies. At this point, however, the results of a study conducted by Neuhous et al. (2010) can be cited. In this study, asymmetry in the body weight distribution on the support plane in the standing position in children with IS was diagnosed, involving both overloading and unloading the convex side of the body, depending on the type of IS according to Lenke [15]. However, it is difficult to refer to the sizes of asymmetry obtained in the study, because each distribution other than symmetric was treated as an asymmetry.
Summarizing the obtained results, it can be concluded that in a significant proportion of children with idiopathic scoliosis there is an asymmetrical body weight distribution on the support plane. Although children with idiopathic scoliosis are much more likely to overload the convex side of the body, some of these children overload the concave side. Overloading the concave side of the body mainly affects children with type IV scoliosis according to King-Moa.
The results obtained in this study, confirming unequivocally the existence of an asymmetric body weight distribution on the support plane in children with mild IS, seem to be important in the context of the pathomechanism of scoliosis. Several recent studies support the hypothesis that, irrespective of the primary triggers of IS, persistent asymmetric mechanical load relative to the spine axis may be a turning point in the development of scoliosis. Therefore, both monitoring the body weight distribution on the support plane in children with mild IS, as well as restoring the symmetry of this distribution should be included in rehabilitation programs for children with IS.
The authors are aware of some of the limitations of this study. First, only children with mild IS were included in the study. Secondly, the body weight distribution on the support plane was as-


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sessed once. Extending the study to the full population of children with IS, as well as carrying out such assessments several times, e.g. in one-year observation, would probably allow us to find out more about the dynamics of the development of asymmetry of the body weight distribution on the support plane in children with IS.

## Conclusions

Despite the above limitations, the following conclusions can be drawn on the basis of the conducted study:
1. The occurrence of disorders in the symmetry of the body weight distribution on the support plane in children with idiopathic scoliosis requires taking these features into account at an early stage of rehabilitation programs for these children.
2. The undertaken study should be extended towards a comprehensive assessment of postural control in children with idiopathic scoliosis, including, in addition to the assessment of the static body weight distribution on the support plane, also the assessment of body position stability control.

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