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*Description of the LW coefficient and the percentage
of difference of the right and left foot burdened with its weight
with reference to males and females
at the age from 4 to 18 in the light of projection moiré*

In the course of phylogenesis the human foot adapted to carrying body on various surfaces, hard and soft, slippery and uneven. In such conditions the muscles performed alternate work, stimulating adaptation, development and perfection of this function.

A foot is one of the most active parts of the locomotor system and, to a large extent, it conditions the locomotion of man. Along with the progress of civilization, the lifestyle has evolved. One of the indices of this process is gradually developing course of releasing lower limbs from the locomotive functions and their simultaneous static overload. As a consequence, there appear, among others, chronic illnesses of the locomotor system, body posture and structure defects. A preventive factor may be recreational physical activeness which effectively allows preventing many consequent changes. Dziak [2] writes: the foot arch is becoming a more and more serious problem in the contemporary world because while fulfilling its very important functions, the foot is exposed to many injuries and overloads caused by excessive burdening with its body weight.

Pains in legs while walking occur as early as in children at the preschool age, and they are signalled by the children as pains in their feet and calves. One of the reasons may be flatness and valgity of feet. Along with the development of this defect, the efficiency of lower limbs decreases, pain and fatigue appear. The consequence of changes in feet may also be changes in knee and hip joints, and in the spine. The condition of feet will also affect the correct posture and locomotion.

The assessment of the regularity of the foot architecture forming bears a very significant diagnostic meaning as any deviations in the structure are reflected in the pathogenesis of chronic illnesses in other parts of body. Commonly applied podometric methods, despite their simplicity and the fact that they are accepted by all orthopaedic centres, provide very divergent results depending on the way of examination and on the application of the assessment coefficients [1,7].

The research carried out by Nadolska [5] in the population of inhabitants of Gorzów Wlkp shows that the left foot is characterized by greater measurements than in the case of the right foot. This observation was confirmed in the case of measurements of feet of the candidates for professional soldiers. The length measurements and the majority of the width

and circumference measurements of this foot showed an advantage over the right foot [4].

This paper aims at the determination of the course of changes in the LW coefficient of feet (LW coefficient = foot length/foot width) burdened with their weight, presented also in percentages.

SUBJECTS AND RESEARCH METHODOLOGY

The research covered the population of 9804 females and 8966 males at the age from 4 to 18 from randomly selected nursery and other schools in the Warmińsko-Mazurski region, table 1. The statistical analysis covered only these research results where the doctor had not diagnosed any considerable posture defects.

The research methodology covered the measurement of the length and width of feet in the researched population of both sexes. For the purpose of the assessment of their values, the attitude towards a computer assessment of posture, with the application of projection moiré technique- Posturemeter M, was used. The methodology and technique of research are in agreement with the generally adopted and described rules [3]. The measuring position consists of a computer, graphic card, program, monitor and printer, projection and receiving device with a camera for measuring feet. Procuring a spatial image is possible only thanks to projecting a line with precisely specified parameters on a child's feet. The lines falling on feet become subject to distortions depending on the surface configuration. Thanks to the application of object glass, the image of a person subject to research can be received through a special optical system with a camera, and then transmitted to the computer monitor. The distortions of the line image are entered in the computer memory, and then they are processed by a numerical algorithm into a layered map of the researched surface [6].

The obtained image of the foot surface enables the interpretation of body posture in many respects. The accuracy of measurement and the analysis of the registered spatial parameters account for the possibility that the drawn conclusions may differ from the ones which have been published so far. The most significant factor in this method is the simultaneity of measurement of all real values of the spatial positioning of particular foot segments.

The LW coefficient (foot length/foot width) and the percentage of its difference were made subject to the statistical analysis. The achieved research results were prepared statistically, determining the average value, standard deviation, variation coefficient, minimum and maximum value. The distribution of variables was normal.

ACHIEVED RESULTS

The research results have been presented graphically. Diagram 1 presents the course of changes in the LW coefficient of the left and right foot and the percentage of differences with reference to females, diagram 3 refers to males. Diagram 2 presents the course of changes in the LW coefficient of the left and right foot and the percentage of differences with reference to both sexes.

FEMALES

The curve of LW coefficient values of the right foot oscillates within the range from 2.51 to 2.73, in the case of the left foot the range is from 2.5 to 2.78.

The curve of the difference percentage of the LW coefficient, when the right foot coefficient is greater than that of the left foot, starts with the value of 3.5%, and it falls to 2.11% in the 6th year of life, next it increases to 4.02% in the 8th year of life and lowers to 1.65% in the 12th year. In the 14th year it takes the value of 3.83%, and then it drops to 2.25% in the 16th year to finish at the level of 2.64% in the last year.

The curve of the difference percentage of the LW coefficient, when the left foot coefficient is greater than that of the right foot, starts with the value of 0.94%, and it rises to 2.81% in the 6th year of life, next it decreases to 1.37% in the 8th year and increases to 4.59% in the 12th year. In the 14th year it takes the value of 2.49%, and then it rises to 4.46% in the 16th year to finish at the level of 3.35% in the last year.

The curve of LW coefficient values of the right foot for both sexes oscillates within the range from 2.54 to 2.69, in the case of the left foot the range is from 2.49 to 2.79.

MALES

The curve of LW coefficient values of the right foot oscillates within the range from 2.57 to 2.74, in the case of the left foot the range is from 2.48 to 2.78.

The curve of the difference percentage of the LW coefficient, when the right foot coefficient is greater than that of the left foot, starts with the value of 3.78% and falls to 2.59% in the 7th year of life, next it increases to 4.54% in the 7th year and lowers to 1.73% in the 12th year. In the 14th year it takes the value of 3.83%, and then it drops to 2.16% in the 16th year to finish at the level of 2.93% in the last year.

The curve of the difference percentage of the LW coefficient, when the left foot coefficient is greater than that of the right foot, starts with the value of 2.46% and rises to 3.28% in the 5th year of life, next it decreases to 1.55% in the 7th year and increases to 3.7% in the 12th year. In the 14th year it takes the value of 2.49%, and then it rises to 5.1% in the 15th year, and it falls again to 1.52% in the 17th year to finish at the level of 2.46% in the last year.

The curve of LW coefficient values of the left foot for both sexes oscillates within the range from 2.54 to 2.69, in the case of the left foot the range is from 2.49 to 2.79.

The curve of the difference percentage of the LW coefficient for both sexes, when the right foot coefficient is greater than that of the left foot, starts with the value of 3.65% and falls to 2.35% in the 6th year of life, next it increases to 4.24% in the 7th year and lowers to 1.69% in the 12th year. In the 14th year it takes the value of 3.77%, and then it drops to 2.22% in the 16th year to finish at the level of 2.83% in the last year.

The curve of the difference percentage of the LW coefficient for both sexes, when the left foot coefficient is greater than that of the right foot, starts with the value of 1.71% and increases to 3.0% in the 6th year of life, next it decreases to 1.48% in the 8th year and increases to 4.17% in the 12th year. In the 14th year it takes the value of 2.28%, and then it rises to 4.5% in the 16th year to finish at the level of 2.78% in the last year.

DISCUSSION

On the basis of available scholarly publications no material presenting the analysis of the researched foot parameters achieved from the assessment with the application of projection moiré has been found.

CONCLUSIONS

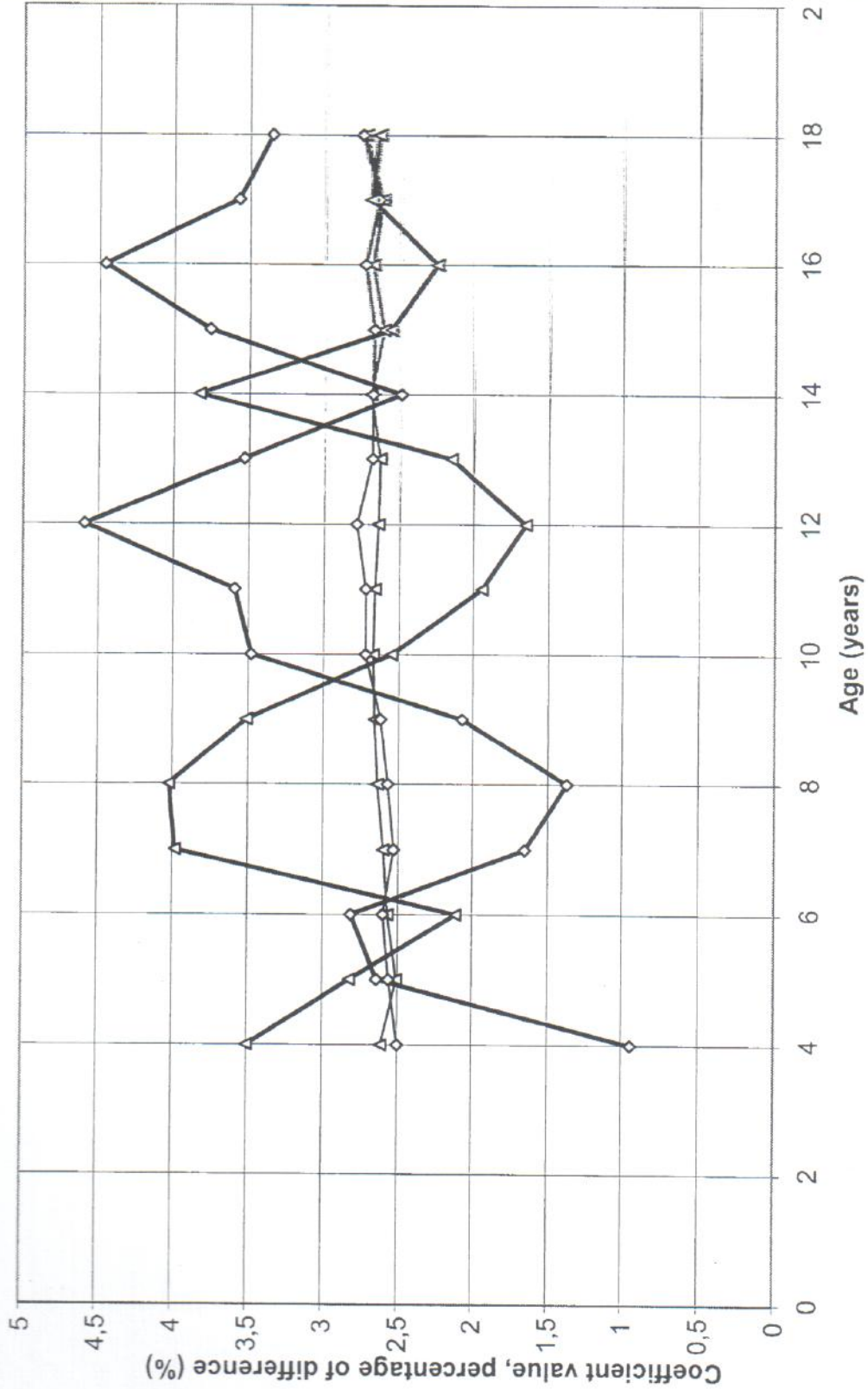
1. The coefficient (LW) of the right foot in the researched population of males and females takes a little greater values than in the case of the left foot.
2. The values of percentage differences of the LW coefficient for the right and left foot are as if reflected in a mirror up to the 14th year of life.

BIBLIOGRAPHY

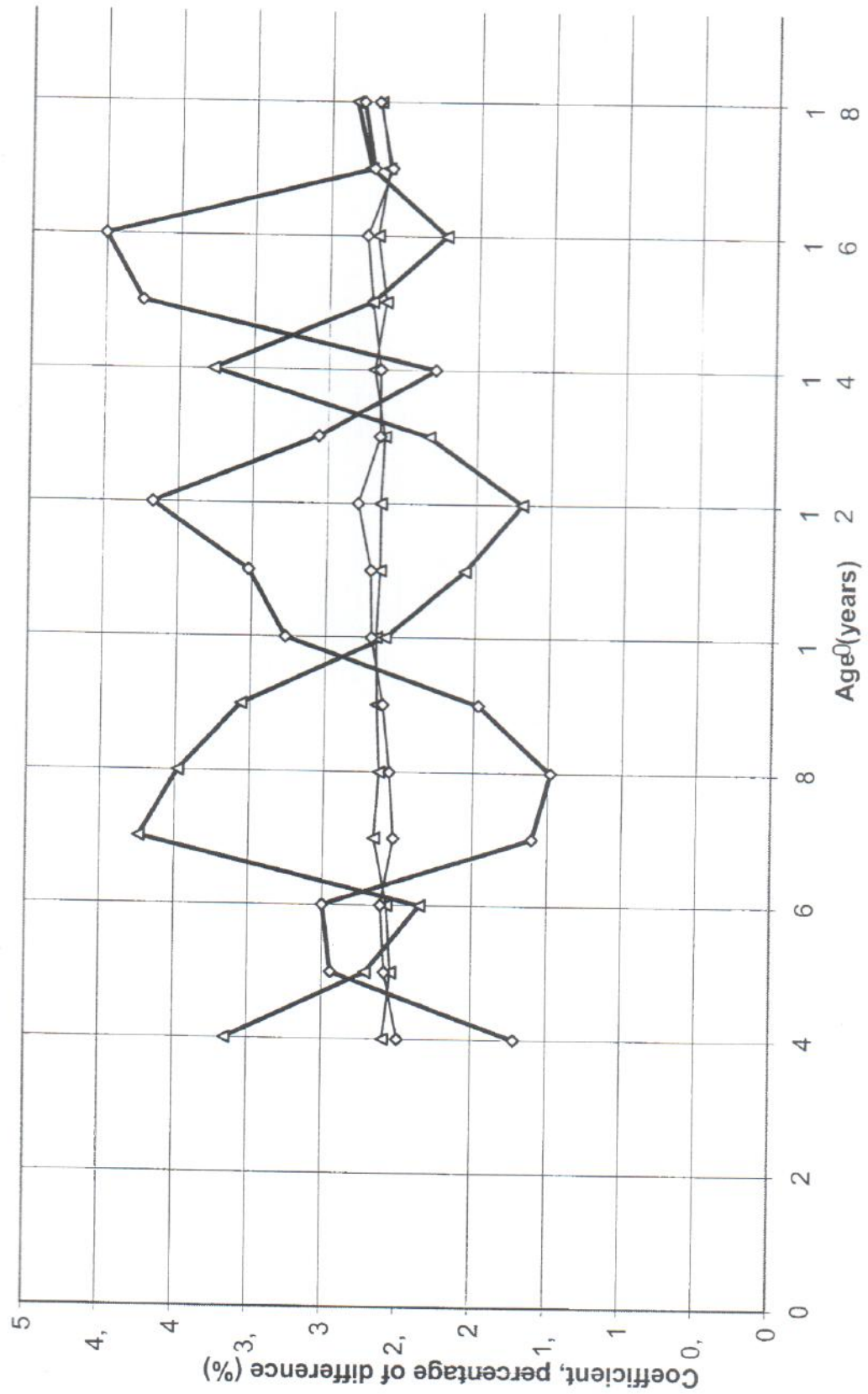
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Description of the LW coefficient and the percentage of difference of the right and left foot burdened with its weight with reference to males and females at the age from 4 to 18 in the light of projection moiré

Diag. 1 Course of changes in the coefficient of feet (LW) and percentage of difference of the left and right foot in female population at the age from 4 to 18 (n) 9804



Diag. 2 Course of changes in the coefficient of feet (LW) and percentage of differences of the left and right foot the population of both sexes at the age from 4 to 18 (n) 18503



Description of the LW coefficient and the percentage of difference of the right and left foot burdened with its weight with reference to males and females at the age from 4 to 18 in the light of projection moiré

Diag. 3 Course of changes in the coefficient of feet (LW) and percentage of differences of the left and right foot male population at the age from 4 to 18 (n) 8699

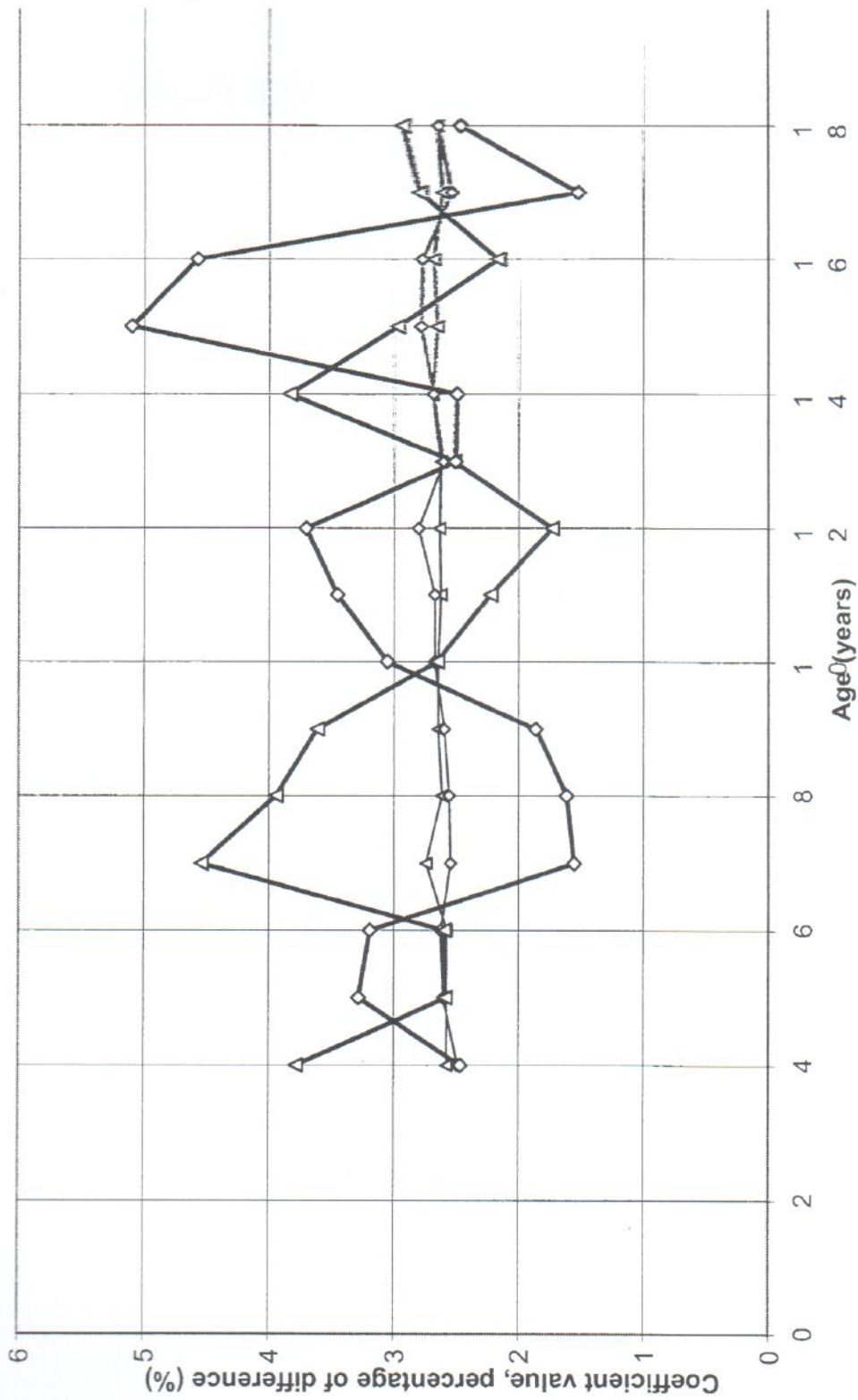


Table 1 Human material, age, body weight and height

Age	F			M		
	Quantity	B.W.	B.H.	Quantity	B.W.	B.H.
4	95	19.1	111.0	104	19.5	109.5
5	196	21.0	113.8	206	20.1	113.0
6	269	22.5	117.3	263	21.7	118.4
7	610	26.42	121.0	597	23.21	127.93
8	1341	26.42	128.28	1255	28.0	130.23
9	1839	30.14	132.87	1677	31.34	134.47
10	1752	35.11	138.26	1542	35.11	139.84
11	1047	41.95	145.0	901	42.48	145.37
12	670	44.77	151.84	549	43.61	151.7
13	569	46.47	157.2	462	48.45	157.52
14	582	52.56	162.24	436	54.25	165.42
15	424	55.25	165.18	355	59.82	169.81
16	108	55.4	162.4	83	58.8	167.7
17	134	57.0	164.7	123	64.0	171.0
18	168	61.3	166.7	146	70.0	175.4
Total	9804			8699		

Source: own research

Legend:

B.W. – average value of body weight

B.H. – average value of body height

F – females

M – males

Mirosław Mroziński

Description of the LW coefficient and the percentage of difference of the right and left foot burdened with its weight with reference to males and females at the age from 4 to 18 in the light of projection moiré

ABSTRACT

The assessment of the regularity of the foot architecture forming bears a very significant diagnostic meaning as any deviations in this structure are reflected in the pathogenesis of chronic illnesses in other parts of body. Commonly applied podometric methods, despite their simplicity and the fact that they are accepted by all orthopaedic centres, provide very divergent results. This is dependent on the way of examination and applied coefficients. Determination of the course of changes in the LW coefficient of feet (LW coefficient = foot length/foot width) and the percentage of difference of the right and left foot burdened with its weight. The research covered the population of 9804 females and 8699 males at the age from 4 to 18 from randomly selected nursery and other schools in the Warmińsko-Mazurski region. The research methodology covered the measurement of the length and width of feet. For the purpose of the assessment, the attitude towards a computer assessment of posture, with the application of projection moiré technique- Posturemeter M, was used. The research results have been presented graphically. Diagram 1 presents the course of changes in the LW coefficient of feet and its percentage with reference to females, diagram 3 refers to males. Diagram 2 presents the course of changes in the LW coefficient of feet and its percentage with reference to both sexes. 1. The coefficient (LW) of the right foot in the researched population of males and females takes a little greater values than in the case of the left foot. 2. The values of the percentage differences of the LW coefficient for the right and left foot are as if reflected in a mirror up to the 14th year of life.