DETECTION OF FEET STATUS IN
FOOTBALL SCHOOL PARTICIPANTS AGED 11 TO 13

(Preliminary communication)

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Abstract

The aim of the research was to present and analyze the foot status of the participants of football school F.C. "Radnicki" from Svilajnac. The sample included 30 participants aged 11 to 13. The foot status variable was determined by the plantography method The data were obtained by the plantogram interpretation using Thomsen's method and the Russian authors method. According to the research findings, it may be concluded that almost 76, 67% of the participants have a certain degree of fallen arches. From the information obtained, we may conclude that it is necessary to take certain measures in order to improve the foot status. Football may be used as an effective measure for the implementation of preventive and corrective effect. This sport has a great impact on the development and improvement of motor functions. A significant impact on the development of bio-motor dimensions such as increasing the strength of lower limbs muscles, speed, flexibility, coordination and endurance can be stimulated by its application. Increasing the strength of the lower limbs muscles prevents foot deformities, since running, kicking a ball, various jumps engage gluteal musculature dorsal flexors and especially the muscles of a lower leg and foot muscles important for maintaining a good foot arch status.

Keywords*: boys, Hypokinesia, flat foot, plantography, Thomsen's method, method of Russian authors, preventive-corrective effect, bio-motor dimensions, percentages*

INTRODUCTION

Generally, the growth of a healthy child is biologically well-programmed, regulated and goal-oriented – according to their genetic potential. Personal distinctions encountered in the developmental period are the result of genetic conditioning but also of numerous external factors which significantly affect the characteristics of an individual. During the long period of psychophysical development of a human body, the organs keep changing their structure and appearance due to the functional requirements which are always new.

During this special and long period of the morphological, motor, physiological and psychological transformations and due to the high incidence of simple deviations transition into real diseases temporarily or permanently changing body posture and natural forms of human body, may occur. Most of these transformations, i.e. disorders in younger children concern postural status and they are the results of the weakness of muscles, joints and connective apparatus of the spine and other parts of the locomotor apparatus (Kosinac, 2008).

These disorders also include feet paramorphisms and feet dysmorphisms. Paramorphism is an abnormality of form. Paramorphism implies morphological deformities which are mainly temporary and can be voluntarily corrected, since the deformities are not based on the changes in the skeleton structure (Kosinac, 2008). The main characteristic of dysmorphisms is permanence. It is about postural deformities which cannot be corrected spontaneously and they require long and arduous treatment, often orthopedic one (Kosinac, 2008). The most frequent deformity of the lower limbs is a flat foot. In the case of this deformity there is a loss (falling) of the physiological arches of the foot. According to the etiology it can be either congenital or acquired.

The congenital flat foot (*pes planus congenitus*) is a very serious deformity, but, fortunately, it occurs very rarely as a result of the changed position of talus bone.

As for the acquired flatfoot (*pes planus aquisitus*), there are many factors that may lead to its occurrence. During the child's development there are some critical periods when the disproportion between the load and the

ability of the foot to bear it, increases. The first period is the phase of child upright position taking; the second delicate period is adolescence, whereas foot falling may occur in adults, as well. In the case of so-called standing professions such as waiters, shop assistants, dentists, surgeons, the foot function is minimized. Static and uniform load of the same foot muscles leads to their rapid fatigue and the decrease of their function as well. (Radisavljević, 2001).

For this reason, it is necessary to move and thus maintain body function, the function of the entire body musculature and the foot musculature, too. The entire biological form and structure of a human body is movement oriented. There is no single cell in the human body, including the most selective organs and organ systems, which is not responsible for movement maintenance and which through its functioning, even in a small portion, does not affect the realization of the movement (Ugarković, 2001).

The richness of movement that sports, games and gymnastics possess is not and should not be the privilege of the young. On the contrary, movements are equally valuable to the adults because they stimulate the activity of many of their vital organs and the organ systems and significantly contribute to the increase of the body and working ability.

The expression "to move is to live" indicates that, in addition to classical methods of physical treatment, methods of active movement represent the foundation of the modern rehabilitation. The significance of movement is confirmed by the words of the great Russian philosopher Secenov "our entire activity in the end comes down to and is realized through directed motor activity". Movement is a basic biological need and it represents a basic stimulator of the growth and development of a body.

Sports games, out of which basketball, volleyball, handball and football are most frequently practiced, may also be used as an excellent tool for strengthening the body in general or for achieving special effects in certain segments of the movement apparatus. Their use should be adjusted to gender, age, body status, current physical and functional condition of an individual, i.e. to the goal pursued. These sports are rich in variety of movements, and each of them also contains some specific movements with greater engagement of the certain segment. This may be used for preventive and corrective work, correcting the negative effects of inactivity and improving physical and functional abilities (Radisavljević, 2001).

METHODS

The sample included 30 participants of the football school F.C. "Radnicki" from Svilajnac, and it is shown in Table 1:

The research involved the feet status variable determined by the plantography method. The plantograms were interpreted and the data were obtained by two methods: Thomsen's method and the method of Russian authors.

Falling of the feet arches may be checked most precisely by the plantography method. In plantography, a metal or a plastic container with multi-layer gauze evenly moistened with a colored substance placed on its bottom, is used. Ink or printing solution mixed with water is most frequently used. Two A4 paper sheets are placed behind the container. A treated person, after putting both feet in the container, steps out of the container leaving the footprints of both feet in the middle of the papers.

Thomsen's method (Figure1) is carried out in the following way: a line is drawn from the centre of the heel, which is precisely determined on a plantogram, towards the lateral edge of the third toe. It represents a boundary line between a normal and a fallen foot and it is known as Mayer's line. If the footprint does not exceed this line toward the medial edge of the foot, the foot is considered normal according to this method's criterion. The footprint exceeding the line indicates certain falling of the longitudinal arch of the foot, requiring further analysis of a plantogram. Further processing implies drawing a tangent connecting the headmost part of the print of heel's medial edge and the footprint of the front foot. After that, the Mayer's line is perpendicularly connected with a ruler to the closest part of the footprint around the middle of its plantum (line segment A), given in millimeters. Then, from the same point of Mayer's line, a line segment B given in millimeters is drawn perpendicular to the tangent connecting the heel and the front foot. After obtaining these two values in order to calculate the index percentage of the longitudinal foot arch, the values are put into A/B x 100 relation. The obtained percentage indicates the degree of the longitudinal foot arch falling, as follows:

 ➢ 1-30% represents 1st degree of the fallen arches,
 ➢ 31- 60% represents 2nd degree of the fallen arches,
 ➢ over 61% represents 3rd degree of the fallen arches.

The disadvantage of this method is that people with normal foot arch are left without the index, i.e. their index is zero, so it makes statistical data analysis more difficult.

The method of Russian authors (Figure 2) is the simplest one. According to it, a plantogram in the front part of the foot and at the level of the first and the fifth metatarsal bone as well as the heel print, are divided into five equal sections. If the footprint, seen from the lateral towards medial part, does not exceed two of the five drawn sections, that is considered a good foot. The footprint covering three of the five drawn sections indicates the first degree, four of the five sections represent the second degree and five out of five signify the third degree of the fallen arches (Ilić, 2012).

RESULTS AND DISCUSSION

Upon processing, the data obtained were shown statistically in a table form, they were descriptively analyzed and conclusions were reached.

We have come to the conclusion that 7 participants, i.e. 23,33% of the overall number of the participants of

Table 1. The sample

| Number	Date of Birth	Playing experience	Dominant leg	Body weight	Body height
1.	22.1.2002.	4 years	right	48.5	154.2
2.	12.3.2001.	7 years	left	48.1	160
3.	16.7.2000.	2 years	right	60.2	165.6
4.	17.3.2001.	2 years	right	45.5	139
5.	27.1.2002.	1 year	right	34.1	150
6.	8.3.2002.	4 years	right	41.1	147
7.	18.7.2001.	4 years	left	58	164.2
8.	15.3.2001.	4 years	right	49.5	159.5
9.	23.7.2001.	4 years	right	59.4	161
10.	31.10.2002.	3 years	right	36.9	148
11.	31.10.2002.	3 years	right	41	146.2
12.	28.2.2002.	7 years	right	4.5	138.2
13.	21.3.2002.	5 years	left	29.3	137
14.	22.8.2000.	3 years	right	43.5	147
15.	27.3.2001.	2 years	right	60	170.2
16.	20.4.2002.	1 year	right	56.4	160.5
17.	15.11.2000.	4 years	right	46.6	160.5
18.	30.6.2000.	1 months	right	55.4	162.3
19.	10.2.2003.	3 months	right	69.5	149
20.	31.7.2000.	1 year	right	38.2	146
21.	30.1.2002.	1 year	right	30	137.1
22.	24.3.2001.	1 year	right	52.3	159
23.	5.4.2002.	6 years	right	35.5	142
24.	11.8.2001.	2 years	right	51.4	157.3
25.	11.5.2002.	9 months	left	55.5	152.6
26.	2.2.2000.	7 months	right	62.2	165.2
27.	22.5.2002.	6 months	right	44	147.7
28.	27.7.2000.	1 year	right	48.2	170.3
29.	20.1.2002.	3 years	right	41.5	139.2
30.	20.11.2000.	8 months	right	66.1	171.9
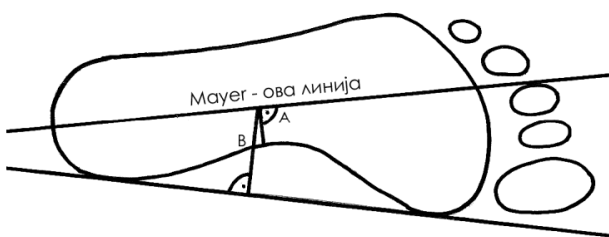
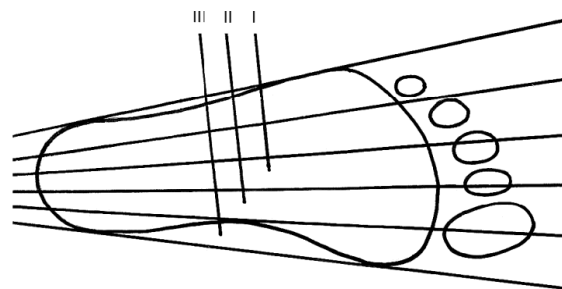*Figure 1. Plantogram interpretation via Thomsen's method*

Figure 2. Plantogram interpretation via method of Russian authors

the football school F.C „Radnicki "form Svilajnac, have regular feet (Table 2).

In Table 3 the review of the results obtained using both methods mentioned is shown.

The interpretation of the results obtained by plantogram interpretation using Thomsen's method:

Analyzing results in Table 4, we may conclude that 11 participants (37%) have regular left foot, 15 participants have the first degree of the fallen arches (50%), 3 participants have the second degree of the fallen arches (10%), and 1 participant has the third degree of the fallen arches (3,33%).

*Table 2. Number and percentage of participants
in relation to feet status*

Sample	Number of participants	Percentage of participants
Overall number	30	100%
Regular feet	7	23.33%
Flat feet	23	76.67%

*Table 3. Rewiev of the results obtained by plantogram
interpretation using both methods*

Number	Thomsen's method		Method of Russian authors	
	Left foot	Right foot	Left foot	Right foot
1.	10,00%	13,60%	1	1
2.	85,11%	92,59%	3	3
3.	/	/	0	0
4.	8,25%	18,70%	1	1
5.	10,00%	7,50%	1	0
6.	/	2,33%	0	0
7.	15,78%	18,82%	1	1
8.	16,60%	13,15%	1	1
9.	/	/	0	0
10.	/	11,90%	0	1
11.	2,33%	21,62%	0	1
12.	2,78%	26,32%	1	1
13.	11,43%	16,67%	1	1
14.	35,00%	18,92%	2	1
15.	/	/	0	0
16.	19,00%	/	1	0
17.	11,79%	13,73%	0	1
18.	/	/	0	0
19.	23,08%	18,18%	2	1
20.	/	/	0	0
21.	39,47%	/	2	2
22.	13,16%	/	0	0
23.	/	15,86%	0	1
24.	35,95%	41,80%	2	2
25.	/	/	0	0
26.	/	11,51%	0	1
27.	21,95%	10,81%	1	1
28.	7,69%	13,51%	1	1
29.	/	/	0	0
30.	5,08%	11,20%	0	1

Review of the results obtained by plantogram interpretation using Thomsen's method:

*Table 4. Number and percentage of participants in relation
to the degree of fallen left arches*

Feet status	Regular feet	1st degree of fallen arches (1-30%)	2nd degree fallen arches (31-60%)	3rd degree fallen arches (over 61%)
Number of participants	11	15	3	1
Percentage of participants	37%	50%	10%	3%

*Table 5. Number and percentage of participants in relation
to the degree of fallen right arches*

Feet status	Regular feet	1st degree fallen arches (1-30%)	2nd degree fallen arches (31-60%)	3rd degree fallen arches (over 61%)
Number of participants	10	18	1	1
Percentage of participants	34%	60%	3%	3%

Review of the results obtained by plantogram interpretation using the method of Russian authors:

*Table 6. Number and percentage of participants in relation
to the degree of fallen left arches*

Foot status	Regular foot	1st degree fallen arches (1-30%)	2nd degree fallen arches (31-60%)	3rd degree fallen arches (over 61%)
Number of participants	15	10	4	1
Percentage of participants	50%	34%	13%	3%

*Table 7. Number and percentage of participants in relation
to the degree of fallen right*

Foot status	Regular foot	1st degree fallen arches (1-30%)	2nd degree fallen arches (31-60%)	3rd degree fallen arches (over 61%)
Number of participants	11	16	2	1
Percentage of participants	37%	53%	7%	3%

The data in Table 5 tell us that 10 participants have the regular right foot (33,34%), 18 participants have the first degree of the fallen arches (60%), 1 participant has the second degree of the fallen arches (3,33%) and 1 participant has the third degree of the fallen arches (3,33%).

The interpretation of the results obtained by planto-gram interpretation using the method of Russian authors:

Further analysis of the data in Table 6 tells us that 15 participants have the regular status of the left foot (50%), 10 participants have the first degree of the fallen arches (33,34%), 4 participants have the second degree of the fallen arches (13,33%) and 1 participant has the third degree of the fallen arches (3,33%).

Analyzing Table 7, we may conclude that 11 participants have the regular right foot (36, 67%), 16 participants have the first degree of the fallen arches (53, 33%), 2 participants have the second degree of the fallen arches (6, 67%) and 1 participant has the third degree of the fallen arches (3, 33%).

CONCLUSION

Upon processing and analyzing the data, we have come to the following conclusions:

Research results indicate that large number of participants have the impaired foot arches, even 76, 67%.

As for the left foot:
• 11 participants have the regular foot arches, 15 participants have the first degree, 3 participants have the second degree and 1 participant has the third degree of the fallen arches (according to Thomsen's method)
• 15 participants have the regular foot arches, 10 participants have the first degree, 4 participants have the second degree and 1 participant has the third degree of the fallen arches (according to the method of Russian authors).

As for the right foot:
• 10 participants have the regular foot arches, 18 participants have the first degree, 1 participant has the second degree and 1 participant has the third degree of the fallen arches (according to Thomsen's method)
• 11 participants have the regular foot arches, 16 participants have the first degree, 2 participants have the second degree and 1 participant has the third degree of the fallen arches (according to the method of Russian authors).

Analyzing the results, it may be concluded that the Thomsen's method results and those of the Russian

authors method are slightly different in that the latter was proven "a milder method", since it showed better results. For example, according to the method of Russian authors 2 more participants have the regular foot arches, and 4 less participants have the first degree of the fallen left arch (compared to the Thomsen's method).

It has been determined that 76.67% participants have the impaired foot arches and that it is necessary to carry out certain corrective treatment. The goal is prevention as well as the prevention of further development of the feet deformities.

However, the obtained results have shown that it is necessary to take all preventive measures possible in order to prevent further progression of the impairment of the foot arch status, and football is certainly sport that is, according to its characteristics, very suitable for the implementation of the therapeutic effects.

Football as the most attractive sport and recreational activity of children, youth and adults has a great impact on the development and improvement of the motor functions. Certain elements of football, due to relatively simple technique and rules as well as the possibility of practicing it in any area, along with the richness of various movements enhancing the development of basic psycho-physical features, may be used in kinesiotherapeutical purposes with some impaired functions of the movement apparatus (Radisavljevic, 2001).

It is necessary to try to tone the exact musculature that was determined to be weak and insufficient through the well selected exercises. These exercises will gain even greater importance if we take into account high percentage of certain deviations from the normal posture, i.e. poor body posture or postural disorders (Koturović and Jeričević, 1996).

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