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THE DETECTION OF THE FOOT STATUS AMONG THE VOLLEYBALL PLAYERS OF THE SCHOOL AGE

(Research note)

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Abstract

The aim of the research was to detect the presence of the suspended arch of the foot among the students of the volleyball club "Dif" from Belgrade. The sample included 35 students of the school age. The results of the research show a very high degree of the foot deformity among the students. This research included the variable of the longitudinal arch of the foot, which is determined by the method of plantography. The plantograms were studied and the data were found using two methods- Thomsen's method and The method of the Russian authors After processing and analyzing the data, we have come to the following conclusions: the results of the research show that large number of the students have deformed arch of the foot, even 88,58%. Considering the left foot: 8 students have normal feet, 21 posses the first degree, 2 second degree and 4 students posses the third degree of the suspended foot (according to Thomsen's method); 10 students have normal arch of the foot, 19 posses the first degree, 2 second degree, and 4 students posses the third degree of the suspended foot (according to the Method of the Russian authors). In view of the right foot, the situation was similar.

Keywords: *normal foot, flat foot hypokinesia, flat foot prevention, correction of flat foot, Thompson's plantogram method, plantogram method of Russian authors*

INTRODUCTION

The modern way of life - a lot of sitting and little moving, is one of the leading causes of the numerous diseases, such as cardio-vascular, respiratory, metabolic, endocrinal, neurological and neuropsychiatry diseases, and even bad body posture and body deformities. This way of life has alienated the man from the natural, biological needs of the organism.

One can say that the movement, the basic motor measure of the moving, is written in a man's genes, as an inevitable part of the life. However, man has gradually reached the point in which, mostly because of the standard and the way of life, most of his everyday duties are performed in the sitting position, which threatens to destroy his own body, developed through the evolution precisely through specific movements. (Ugarković, 2001)

The urban conditions, spatial surrounding and the sedentary way of life have bad influence upon the development of children, especially upon the postural status, and the foot deformities within. When we speak about the foot deformities, which are partly genetically determined, it is certain that already mentioned modern way of life has direct influence upon the proper development of the foot. To diagnose the foot status on time is the first priority task, in order to undertake the necessary actions and remove the possible deformities. The evolution of the foot development is in the casual relationship with the age. Since the formation of the arch of the foot lasts until the age of 4, and it is relevant that the possible deformity can be determined afterwards (Mihajlović, Solaja and Petrović, 2010).

The presence of the flat foot becomes more and more frequent along with the development of the modern civilization. One of the main reasons is hypokinesia which affects mostly children who are living at the cities, because they are mostly walking over the hard, flat surface. Inadequate footwear restricts and constrains the activity of the lower leg and the foot muscles, while the long-lasting load causes the insufficiency and weakening of the muscles in the lower legs and feet.

Volleyball can be used as very effective method for

achieving both preventive and corrective influence. By specific movements which abound the game, altogether with the arm movements, the multiple influences on the locomotor apparatus is achieved. By insisting on taking the proper volleyball stand, the commitment of the spine extensors and the adductor scapula are achieved, which prevents the appearance of the kyphosis and other spine deformities. By performing the leaps, jumps, shifting body weight to the front part of the foot and prancing on the toes, as well as great engagement of the lower limbs, especially the lower leg and foot muscles, are very important toward achieving and keeping the good status of the foot.

There are more and more children with a flat foot. The flat foot can be congenital and acquired. Congenital flat foot is very rare and represents a very serious deformity, because it occurs as the consequence of a changed position of the talus bone, which occupies the vertical position.

The presence of the flat foot becomes more frequent with the development of the civilization, because its purpose for catching things has completely vanished and its only present purpose is to be leaned on. Another reason is the hypokinesia which affects mostly of the children who live in the cities, because they usually walk across hard and flat surface. In other words, the long-lasting load causes the insufficiency and weakening of the muscles in the lower legs and feet. Inadequate footwear which restricts and constrains the activity of the lower leg and the foot muscles has bad influence upon the foot development. The presence of this deformity is not that often phenomenon among the children who live in the rural environment and walk barefoot across the uneven surface. (Radisavljević, 2001)

The proper shape and function of the foot are directly dependable on the properly built bone structure and the good balance of the muscles which are included during the standing and walking. The suspended arch of the foot occurs as the consequence of the disruption of this balance.

The foot, despite being a very small organ, presents an integral part of the human body. Considering its anatomy, it consists of 26 bones. The bones, which are more or less mobile, are sorted in the way which gives the foot a shape of the bifurcated arched lever. The physiological posture of the foot provides the balance between the actions of the body weight on one, and the muscle tonus on the other side. Numerous joints are providing special mobility and flexibility.

A child is born with seemingly flat feet, which is a consequence of the presence of so called "fat pillow" which fills the plantum of the foot. Under the influence of the functional stimulation during the standing and walking it gradually disappears, so the longitudinal and transversal arches completely develop only after the age of two. (Radisavljević, 2001)

The most common foot deformity is the flat foot *(pesplanus)*. This deformity is the most common among the school children. It is certain that the modern way of life causes, or at least contributes to the development of this deformity. Excessive use of the different means of transport leads to reduced activity of the foot muscles, which is within the process of development among the children *(*Koturović and Jericević, 1996).

During the long-lasting load, the back end of the foot, especially the *calcaneus*, twists toward the inner side, performs a pronation which leads to the disappearance of the arches and the foot becomes flat *(pesplanus)*. (Bosković, 2005)

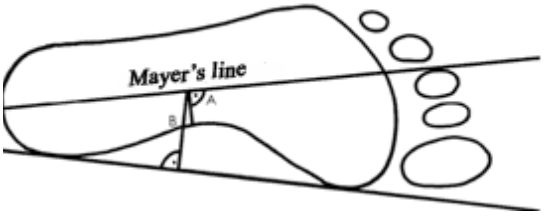
METHODS

The sample presented in the following chart consists of 35 students of the volleyball club "Dif" from Belgrade, aged from 8 to 15.

This research includes the variable of the longitudinal arch of the foot, which is determined by the method of plantography. Plantograms were studied and the data were found using two methods - Thomsen's method and a method of the Russian authors.

The most reliable method toward checking the presence of the suspended arch of the foot is the plantography method. For this method we need a metal or a plastic pot with multi-layered gauze, previously soaked in paint on its bottom. We normally use ink or a signet solution mixed with water. Behind the pot we put two A4 sheets of paper. The examined person, after stepping into the pot with both legs, steps out, leaving the sole print on the middle of the paper. (Ilić, 2012)

The Thomsen's method *(Picture 1.)* consists of drawing a line on the footprint - from the centre of the heel to the lateral edge of the third finger. If the print doesn't cross over the medial edge of the foot, the foot is normal. However, if the print crosses the Mayer's line, the tangent line, which connects the most exposed medial parts of the heel with the print of the front part of the foot in the height of the metatarsus bone, is drawn. The next step is to draw a line which connects the Mayer's line with the nearest part of the footprint, under the right angle (segment A) Starting with the same point, we draw another line (segment B) which is perpendicular to the tangent line. The index of the percentage of the suspended foot is gained when quotient (presented in mm) of A and B times 100 (A/B x 100). The percentage reached this way shows the percentage of the suspended arch of the foot (Ilić, 2012).

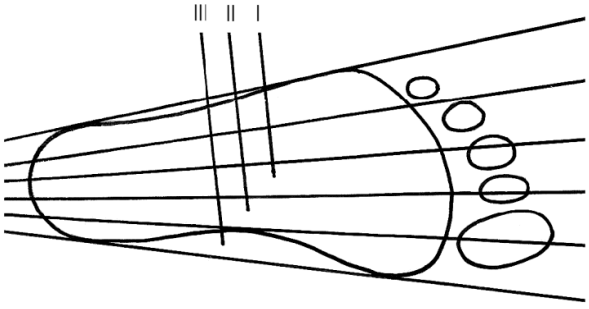


Picture 1. Discussing the plantogram using the Thomsen's method

- 1-30% = I degree of the lowered arch of the foot,
- 31- 60% = I degree,
- over 61% = I degree.

The disadvantage of this method is leaving the people with normal feet without the index-their index is zero, which makes the statistical data processing more difficult.

The method of the Russian authors *(Picture 2.)* is the simplest one. According to this method, both the plantogram, in the frontal foot in the height of the first and the fifth metatarsus bone, and the heel print are divided into five equal parts. If the footprint, watching



Picture 2. Discussing the plantogram by using the method of the Russian authors

from the outer to the inner side, does not cross two out of the five fields, it is considered to be a good foot. If the foot print occupies three out of five fields, it is the first degree; four out of five means the second degree, while five out of five means the third degree of the suspended foot.

- 3/5 of the plantogram= I degree of the lowered arch of the foot
- 4/5 of the plantogram= II degree
- 5/5of the plantogram= III degree

The results shown in the text are reached by discussing the plantogram using the two methods - the Thomsen's method *(Picture 1.)* and the method of the Russian authors *(Picture 2.)*. Both data were separately discussed.

The data show that 4 students have normal feet, which is 11.42% of the total number of the students from the volleyball school "Dif" *(Table 2)*

RESULTS

Results found by using the Thomsen's method

The data are further analyzed in the *Table 3.*, which shows the number of the examinees related to the degree of the suspended left foot. They are show that 8 of the examinees have the normal foot, 21 posses the first degree (1-30%), 2 posses the second degree (31-60%) and 4 posses the third degree of the suspended foot deformity (over 61%).

Table 4., shows the number of the examinees related to the degree of the suspended right foot. The data show that 7 students have normal right foot, 22 posses the first degree (1-30%), 2 posses the second degree (31-60%), while 4 of them posses the third degree of the suspended foot (over 61%).

Results found by using the method of the Russian authors

The data presented in the *Table 5.* show that 10 students have normal foot, 19 of them posses the first degree, 2 of them the second degree and 4 of them the third degree of the suspended right foot.

In the *Table 6.* the degree of the suspended right foot is presented. The data show that 7 students have the normal foot, 22 have the first degree, 3 have the second degree and 3 have the third degree of the suspended right foot.

The foot carries most of the load during most of the activities man does, especially in volleyball, which requires a lot of jumps and vertical movements. During the landing, the foot suffers much bigger load than while standing, because of the inertia force.

The foot deformities, especially the flat foot, can be a big problem during the everyday activities. For this reason, it is very important to work on the very prevention.

The easiest therapy for treating the flat feet is walking barefoot, especially across the uneven surface, such as grass, gravel, sand etc. Walking across this kind of surface encourages various mechanical stimulations which lead toward activation of the foot muscles, especially those on the plantar side, which has the positive effect upon the proper foot development. The proper choice of the socks and the footwear is also a kind of prevention.

It is determined that 88,58% have deformed arch of the foot, which demands certain corrective treatment. The aim is to prevent and stop any further foot deformities.

The exercise can be applied by using numerous starting positions, but it is certain that the sitting, followed by the standing on, or next to the ripstol, or walking, are the most convenient during the first phase. The standing position can be used preventively, that is in case when the changes are not exposed that much, that the standing or load could affect them negatively (Koturović and Jericević, 1996).

After analyzing the results, we have come to the conclusion that there is only a slight difference between the results reached using the Thomsen's and the ones reached by using the method of the Russian authors. The difference is reflected in the fact that the method of the Russian authors is presented as "more permissive", because, according to Russian authors, two more students have a normal foot, two students less have the first degree of deformity of the left foot, and one student less has the third degree of the suspended right foot (comparing to the Thomsen's method).

Table1. The sample of the examinees

Ordinal number	Sex	Date of birth	Gaming experience	Dominant arm	Body weight (*kg*)	Body height (cm)
1.	F	24.9.2000.	2 years	Right	49.7	154.9
2.	M	21.12.2000.	2 months	Right	52.9	151.8
3.	F	1.8.1998.	4 years	Left	47.2	167.6
4.	F	17.8.2001.	4 years	Right	23.5	135
5.	F	20.9.1999.	2 years	Right	57.2	157.3
6.	F	5.3.1999.	1 year	Right	44.1	160.1
7.	F	19.9.2001.	9 months	Right	54	156.8
8.	F	26.3.2001.	4 years	Right	49.5	155.5
9.	M	1.1.2001.	8 months	Left	59.9	157.4
10.	F	22.7.2002.	7 months	Right	40.9	139
11.	F	22.4.1997.	3 months	Right	52	163.4
12.	F	13.7.2001.	2 months	Right	47	141.5
13.	F	7.11.2001.	8 months	Right	44.4	148.8
14.	F	22.3.2003.	3 months	Right	43.9	148.5
15.	F	28.3.1999.	9 months	Right	69.4	167.6
16.	F	22.6.1997.	8 months	Right	54.4	165.2
17.	F	7.11.1999.	9 months	Right	48.2	157.6
18.	F	14.5.1999.	8 months	Right	54.6	165.5
19.	M	25.10.2001.	8 months	Right	36.8	145
20.	F	7.11.2000.	8 months	Right	57.6	156.1
21.	F	29.7.2003.	8 months	Right	52.6	143.1
22.	F	15.9.2000.	3 years	Right	46.2	162
23.	M	25.5.1999.	5 years	Right	41.5	156
24.	M	17.4.2000.	9 months	Right	62.6	163.2
25.	M	11.5.1999.	6 months	Right	65.3	151.4
26.	M	9.6.2003.	7 months	Right	38.8	139.2
27.	F	12.5.1997.	5 months	Right	56.4	171.4
28.	F	12.5.1997.	6months	Right	59.4	176.5
29.	F	18.9.2002.	9 months	Right	37.5	145.5
30.	M	22.2.2000.	8 months	Right	73.4	173.9
31.	F	25.7.2002.	9 months	Right	40.3	147.3
32.	F	18.2.2001.	5 months	Right	59.7	156
33.	F	2.4.1998.	9 months	Right	56.5	163
34.	F	10.11.2001.	9 months	Right	40.3	141.9
35.	M	17.3.2004	9months	Right	32.7	130

Table 2. Number of the ehaminees with the flaat foot

Sample	Number	Percentage
Number	35	100
Normal foot	4	11,42
Flat foot	31	88,58

Table 3. Number of the examinees related to the suspended left foot degree

Foot status	Normal foot	I degree (1-30%)	II degree (31-60%)	III degree (over 61%)
Number of the examinees	8	21	2	4

Table 4. Number of the examinees related to the suspended right foot degree

Foot status	Normal foot	I degree (1-30%)	II degree (31-60%)	III degree (over 61%)
Number of the examinees	7	22	2	4

Table 5. Number of the examinees related to the suspended left foot degree

Foot status	Normal foot	I degree	II degree	III degree
Number of the examinees	10	19	2	3

Table 6. Number of the ehaminees related to the suspended right foot degree

Foot status	Normal foot	I degree	II degree	III degree
Number of the examinees	7	22	3	3

However, the results show that it is necessary to carry out all the preventive measures necessary, in order to stop further progression of deforming the arch of the foot, and volleyball is a sports game appropriate for conducting the therapeutic influence.

The volleyball outplaying belongs to the efforts of the submaximal intensity, with the characteristics of the short serial demonstrations which are rarely repeated in succession, but in the time intervals of 40 minutes to more than 3 hours, although in modern practice, games usually last about 90 to 120 minutes (Tomić and Nemeć, 2002).

The specific movements which abound the game (moving forwards, backwards, laterally, leaps, jumps), altogether with the arm movements (service, smash, block), have the multiple influence on the locomotor apparatus and cardio-vascular and respiratory system.

By performing the leaps, jumps, shifting body weight to the front part of the foot and prancing on the toes, represents a great engagement of the lower limbs, especially the lower leg and foot muscles are important for keeping the good status of the foot, are achieved. The muscles of the hand, forearm, upper arm and especially musculature of the shoulder and scapula are especially engaged while performing large number of elements. Volleyball can affect the preservation of the proper body posture. By insisting on taking the proper volleyball stand, the commitment of the spine extensors and the adductor scapula are achieved, which prevents the appearance of the kyphosis (Radisavljević, 2001).

It is necessary to carry out both foot inspection and corrective treatments as often as possible. These treatments include application of the movement for both preventive and corrective purpose.

If we want the movement to have both preventive and corrective effect, it has to be studied in detail, applied properly and dosed according to the current condition of the physical and functional abilities of an individual. (Radisavljević, 2001).

CONCLUSION

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

The results of the research show that large number of the students have deformed arch of the foot, even 88,58%.

Considering left foot:

- 8 students have normal feet, 21 posses the first degree, 2 second degree и 4 students posses the third degree of the suspended foot (according to Thomsen's method)
- 10 students have normal arch of the foot, 19 posses the first degree, 2 second degree, a 4 students posses the third degree of the suspended foot (according to the method of the Russian authors)

Considering right foot:

- 7 students have the normal arch of the foot, 22 posses the first degree, 2 second degree and 4 students posses the third degree of the suspended foot (according to Thomsen's method)
- 7 students have the normal arch of the foot, 22 posses the first degree, 3 second degree and 3

studentsposses the third degree of the suspended foot (according to the method of the Russian authors)

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