The relationship between flat feet and cavus foot with body mass index in girl students

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ABSTRACT:

Background and Aims: The aim of this study was to investigate the relationship between flat feet and cavus foot with body mass index in girl students.

Methods: The study population consisted of the Mazandaran University students that their number was 260 (130 girl college students and 130 girl students of non-physical education) formed. Sampling of participants over the two days. Height and weight of the subjects were measured, then they were placed on a mirror box and were taken the photographs of the Plantar foot. for picture Plantar foot was used of the mirror box (pedescope). data analyzed by Pearson and Spearman correlation coefficient.

Results: The results of Pearson correlation coefficient test in physical education subjects showed there was no relationship the between BMI and flat feet (0.306). Also, the relationship between BMI and cavus foot was significant and direct (0.330). The results of Spearman correlation coefficient test in physical education subjects showed that the relationship between BMI and flat feet was significant (0.457). Also, there was no relationship between BMI and cavus foot (-0.026). The results in non-physical education subjects showed the relationship between BMI and flat feet was significant, but was in the opposite direction (-0.493). Also, the relationship between BMI and cavus foot was significant and direct (0.424). The results of Spearman correlation test showed that the relationship and flat feet was significant but was in the opposite direction (-0.648). Also, the relationship between BMI and cavus foot was significant (0.413).

Conclusion: According to the results of this study, it seems to there was no relationship between flat feet and cavus foot with body mass index in girl students.

KEY WORDS Flat feet, Cavus foot, Body mass index, Mirror box (pedescope), Girl students

INTRODUCTION

Foot condition is an important factor affecting the function of the lower extremity, so it plays an important role in the injury [1]. Curvature of the feet provides the ability to perform their tasks in a natural and appropriate manner; however, the collapse of the protective elements of the feet’s Curvature can cause abnormal conditions such as feet and shoulder feet
CAVUS FOOT WITH BODY MASS INDEX IN GIRL

Methods

The statistical population of the study consisted of female students of Mazandaran University with 260 students (130 female physical education students and 130 female non-physical education students). Samples were taken from the subjects in two days. First, their height and weight were measured. They were then asked to be placed on a mirror box to take photos of their feet. The first day of the physical education group was taken. Sampling lasted from 11 am to 14 pm and was sampled on the second day of the physical education group. The sampling of this group lasted from 11 am to 12.30 am.

Body Mass Index

For body mass index, the subjects were divided by weight in [kilograms], on height squared in [meter].

Method of measuring the height of the subjects

To measure the height of the subjects, SKA wall washer was installed. Then, the height of the subjects without shoes was measured with a normal exhalation, while the legs closed to each other and the pelvis and the back of the shoulders were also attached to the wall.

Method of evaluation of the flat foot by the pedoscope

Smooth foot measurement methods include a footprint recording method, a mirror box (pemometer), arc height measurement, line drawing, and lane guidance. In this study, the measurement method using the Mirror Box (The pedoscope was used. Mirror box is a device that, when placed on the person, allows you to see the bottom of the foot below the mirror. In this way, the person stands on the top of the mirror box. The healer of his footprints is viewed and evaluated on the mirror. Viewing the skin color of the arch region during weight bearing is easy and convenient for diagnosis [15].

The subject was asked to put the footprint without a shoe and Socks, so that the weight is evenly divided between the two feet. In this case, the researcher is placed behind the subject and according to the footage image of the subject in the pedicure mirror; the subject's smoothness can be detected and recorded.

The method of evaluation of the bottom of the foot by the Pedoscope

The subject was asked to put a pair of shoes and socks on the Pedoscope in such a way that the weight is evenly divided between the two feet. In this case, the researcher behind the subject is able to detect and record the bezel of the subject's subject, according to the subject's footage image in the pedicle mirror. It was used to shoot a 4-megapixel digital camera (Sony-4.0 mega pixel. Japan-cmos / carl zeiss.film dvd 808e n50).

Statistical Results

The various factors give rise to the flat foot and the bottom of the foot, including the age, sex, weight, race, and some other anthropometric factors that make it one of the most serious and common problems in the 21st century [7,8]. Meanwhile, Body Mass Index (BMI) is an indicator of functional and easily estimated relative weight and is largely linked to most direct obesity measures. The BMI depends on the extent on the physical composition. This index has a certain international level. BMI is a tool for evaluating healthy body weight. BMI is calculated by measuring the ratio of individual weight to height squared and is used to determine obesity and overweight. Several reports have shown that overweight and obesity may affect foot structure in children and adults [9, 10]. Fattahi and Goodarzi (1395) showed that there is a significant relationship between BMI anthropometric index and flat foot posture [11]. However, some researchers have reported that there is no relationship between obesity and flat feet. For example, Atmaetok reported that changes in arc-feet are not related to body weight and are related only to legs [12]. The flatness of the flat foot differs from one study to another. Some researchers have shown that the prevalence of flat feet increases with age. Some studies also refer to sex with the prevalence of flat foot [13, 14]. In general, studies on the prevalence of flatfoot in young people and adults, especially girls, are limited. Determining such a relationship is likely to affect and correct the methods of managing the flat foot. On the other hand, because of the low researches conducted in this field, is the best motivation to study about it. The presence of abnormalities for various reasons causes disorders in young people, especially girls, and the lack of knowledge about these problems necessitates an association between anthropometric indices and the prevalence of skeletal and muscular anomalies. As mentioned, to date most studies have been conducted on the prevalence of flat foot in children, and studies conducted on young people are very limited. Therefore, this study intends to investigate the relationship between flat foot and shoulder foot with body mass index in female students.

[2]. The pes planus commonly known as flat feet or arches is a medical condition in which the arc showing the length of the leg is flattened outwards or downwards. Flat feet may affect one of the legs or both, and not only increases the amount of leg that acts on the leg structure, but also interferes with normal foot function. As a result, those with a flat foot experience upsetting during periods of prolonged periods of time and showing a distinctly smooth [3]. The symptoms of the flat foot include softness of the palm of the foot, collapse of the ligaments, rapid fatigue of the leg, pain with pressure and instability of the middle structure of the feet [4]. On the other hand, the lower leg, which is associated with excessive joint stenting, may have a negative effect on postural control due to the low foot retention position in which the foot is in the normal position of bearing weight [5]. People with flat feet and the arched feet have a higher risk of foot pain, knee pain, foot injuries, fracture, and poor exercise performance [6].

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After the sampling, data obtained from the BMI of the students was calculated based on height and weight. Pearson correlation coefficient and Spearman correlation coefficient were used to describe the collected data.

FINDINGS

The Descriptive indexes of the subjects in physical education and non-physical education groups are presented in tables 1. The results indicated that most subjects were physically combined in the second group, the natural combination.

![Foot Types](image1)

**Figure 1.** Plain (AB), Bonus (BC) and Natural Foot (right to left) respectively.

![Foot Placement](image2)

**Figure 2.** Placement of the subjects' feet on the mirror box (pedoscope).

| Table 1: Average height, weight, body mass index (BMI) |   |
|------------------------------------------------------|--|

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Table 2: Physical Education Physical Fitness Outcomes

| n | Frequency | BMI       | Body type |
|---|-----------|-----------|-----------|
| 1 | 1         | Less than 18.5 | Slimming |
| 2 | 2         | 18.5-24.9   | normal   |
| 3 | 2         | 25-29.9     | Overweight |
| 4 | -         | 30-34.9     | Obese    |
| 5 | -         | More than 35| Very Obese |

Table 3: Physical Outcome Physical Outcomes

| n | Frequency | BMI       | Body type |
|---|-----------|-----------|-----------|
| 1 | 1         | Less than 18.5 | Slimming |
| 2 | 2         | 18.5-24.9   | normal   |
| 3 | 2         | 25-29.9     | Overweight |
| 4 | -         | 30-34.9     | Obese    |
| 5 | -         | More than 35| Very Obese |

Table 4: Relationship between arc type with BMI of physical education group and non-physical education group

| BMI | physical | non-physical |
|-----|----------|--------------|
| Curve type | Overweight | normal | Slimming |
| Flat    |          |          |          |
| Normal  |          |          |          |
| Curvature |          |          |          |

There were 2 non-physical education groups and 6 facultative physical education groups. It was remarkable that in both physical education and non-physical education, there was no sample of obesity or obesity (Table 2 and 3). The results of Pearson correlation coefficient in physical education showed that there was little or no correlation between BMI and flat foot (r = 0.306). Also, there was little or no relation between the BMI and the hip (r = 0.330). In physical education samples, the results of Spearman's correlation coefficient showed that the relationship between BMI and flat feet (r = -0.457) was significant between these two. Also, the relationship between BMI and hip was (r = -0.226), which indicated that there was no relationship between them at all. The results of Pearson correlation coefficient in non-physical education showed that the relationship between BMI and flat foot (r = -0.493) was between the two mean and significant but in the direction of the image. Also, the relationship between BMI and hip score (r = 0.442) was meaningful and direct between these two meanings. The results of Spearman's correlation coefficient showed that the relationship between BMI and flat feet (r = -0.457) was significant between these two. Also, the relationship between BMI and hip was (r = -0.226), which indicated that there was no relationship between them at all. The results of Pearson correlation coefficient in non-physical education showed that the relationship between BMI and flat foot (r = -0.493) was between the two mean and significant but in the direction of the image. Also, the relationship between BMI and hip score (r = 0.442) was meaningful and direct between these two meanings. The results of Spearman's correlation coefficient showed that the relationship between BMI and flat feet (r = -0.457) was significant between these two. Also, the relationship between BMI and hip was (r = -0.226), which indicated that there was no relationship between them at all. The results of Pearson correlation coefficient in non-physical education showed that the relationship between BMI and flat foot (r = -0.493) was between the two mean and significant but in the direction of the image. Also, the relationship between BMI and hip score (r = 0.442) was meaningful and direct between these two meanings. The results of Spearman's correlation...
coefficient in non-physical education showed that the relationship between BMI and flat feet (0.648) was significant and moderate, but in photo orientation. Also, the relationship between BMI and hip score (0.431) was moderate and significant.

**DISCUSSION**

The results of this study show that non-athlete students have more abnormalities in their legs than athlete students. Most of the samples in this study were almost normal. Some samples of flat feet were observed that were in the body composition in the weight gain group. Anthropometric status of the body can affect walking biomechanics and a strong prediction of disturbances and functional factors. Body mass index is a determining factor in determining the major function in a wide variety of both static and dynamic tests. Consistent with the findings of this study, O’Brien and Tindieck (2014) in a study on a wide range of ages between 20 and 70 years showed that individuals with the normal BMI had the highest normal leg arches. In the overweight area, individuals had all three types of arches (smooth, normal, and legless), while the obese group had a normal and lower limb classification [16].

Evans also did not see a positive relationship between body weight gain and flat foot [7]. In addition, Hier et al. (2014) concluded in a study of people aged 18 to 25 years that the prevalence of smooth flat feet in the 18- to 25-year-old population was 11.25%, and there was no significant difference with regard to gender, and none There was no correlation between BMI with arctic indexes [17]. Although sample size, race, and posture assessment method may be important in the conclusion, Gender comparisons showed that the index of arc in men and women was not found to be significant in normal, overweight and obese groups, supported by Zen et al. [18]. On the other hand, the structure of male and female feet is different from anatomical point of view as well as walking between them [19].

Obese or overweight children are reported to be more likely to have a flat foot compared to normal-weight children [20, 21]. Fifeff et al argued that the middle arch of preschool children’s footprints was affected by three factors: age, sex, and weight, which, with age, reduced the chance of flatfoot by 36.8% per year. Fifeff et al examined the prevalence of flat foot in children and showed that obese children tend to have a flat foot compared to normal-weight children. They said that the likelihood of a flat foot in obese and overweight children was three times more likely than normal-weight children [22]. On the other hand, an increase in the AR index value with the increase in BMI, as indicated in the present study, is consistent with studies that have examined the effect of BMI on the basis of radiography and arc structure in adults [23]. Most of our samples are in the body composition in the second group, the natural combination. There were about 12 non-physical education groups and 2 overweight physical education groups. 2 people were from non-physical education group and 6 from the physical education group were skinny bodies. The remarkable thing was that in both physical education and non-physical education groups there were no samples of obesity or obesity. Stahlley et al. evaluated the changes in the level of flatfoot in different age groups and expressed that their rate in children was higher and among young adolescents and young adults decreased and then the trend increased. In addition, the results indicated it is that after the age of 50, the prevalence of flatfeet begins to decline again [24]. Since the subject in the present study were girls and their age ranged from 18 to 22 years old, the results of this study were should be consistent with previous studies that examined some anthropometric features and feet abnormalities.

In contrast, the results of this study are not consistent with the findings of Rohetighi et al. (2016), which show a significant increase in arc index values from normal to obese. They stated that the index of arch index (AI) had a significant positive correlation with the increase in body mass index [19]. Gano and Panahal also concluded that obesity reduced the internal length of the arch due to the excessive overload of the weight forces, and thus had a negative effect on the index of the arch of the foot (25). A Harland study on obese children showed that the index of the arch was significantly longer and wider than its normal counterparts [26]. Several cases of abdominal pain were observed in the present study; however, there was no significant correlation between weight gain and abdominal pain.

Sullivan raises the smoothness of the foot and the exact extent of the outbreak is unknown [27]. The reason for the difference in the prevalence of the footprint in various studies is the anatomical and physiological factors, heredity and high weight, geographical and cultural factors, such as how to cover shoes, the lack of precise clinical criteria for assessing the position of the arch of the foot, the difference in age groups The study was conducted on factors such as height, weight and salivation of ligaments. In addition, the unanimity of the method of work can also be attributed to the difference in the prevalence of flat foot scissors in various studies. In the present study, the Mirror Box was used. The relationship between flat foot and lower leg was measured by BMI in female students of physical education and physical education. Poor walking mechanics that are known in plain-skinned individuals have been shown to increase the contact areas and load below the middle of the foot, which can lead to abnormal loading of adjacent ligands and tendons and modifies normal joint mechanics [28].

There are several theories that explain the increase of the flat foot. A number of studies have suggested that foot abnormalities are related to the habit of wearing shoes and the beginning of wearing shoes. [29] In addition, a number of studies have claimed that obesity or body weight should also be considered in the course of this abnormality [20, 21]. Of course, Stathit Undam and Joseph studied the relationship between flat foot and BMI, which is indicative of obesity, using the foot role.
registration method and found that there is no relationship between these two variables [2].

The mechanical loading of the flattening of the foot is transmitted to adjacent areas such as the knees, thigh and lower back, and therefore, flat foot as a contributing factor in a wide variety of medical conditions, including musculoskeletal pathogenesis- Lower legs such as lower legs, Achilles swelling and pain in the hip joint are diagnosed. Flat feet abnormalities are usually regenerated using a number of remedies. Such devices are designed to provide stability and rearrange arches, and can be described descriptively to reduce the symptoms of the patient [31]. Recent biomechanical studies have shown that corrective shoe insoles improve accurate parallelism, increase the length of standing on the pavement surface, and reduce the maximum angle of the foot rotary and inner spin. [32]. Flat feet in children during the first years of life are a matter of concern for parents.

**DISCUSSION**

The results of this study indicate that excessive increase in weight bearing forces due to increased body mass may negatively affect the lower limbs and legs. In addition, future research should consider overweight individuals with age, gender, and lifestyle, in order to better understand the complications of body mass. The results of this study can be useful in preventative and rehabilitation interventions to improve the quality of life of obese and overweight people.
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