European Journal of Physical Education and Sport Science
ISSN: 2501 - 1235
ISSN-L: 2501 - 1235
Available on-line at: www.oapub.org/edu

10.5281/zenodo.51628
Volume 1 | Issue 3 | 2016

COMPARISON OF THE LONGITUDINAL ARCH OF THE FOOT MALE ELITE ATHLETES AND NON-ATHLETES IN SWIMMING AND TRACK AND FIELD

Majid Bakhshi
MA Physical Education, Shahrekord University, Shahrekord, Iran

Abstract:
The aim of this study was to compare the longitudinal arch of the foot male elite athletes and non-athletes in swimming and track and field. Since the researchers based on the facts, available research and variable already exist in the sample were imported by the researcher. This study was causal-comparative field-descriptive. The population of this research was an was chosen from elite athletes branch man who has 5 years of experience in swimming and athletics who has professional training and non-athletes. People students participating in public physical education course in the second semester of the academic year enrolled 2014-15 were included. A statistical sample study of 80 elite was chosen between male athletes in swimming and track and field. 20 individuals were chosen from each. And 20, as well were chosen between non-athletes. The students participating in physical education classes Unit 1 Shahrekord University 2014-15 in the second semester of the academic year (as a control) were selected randomly. Foot arch height ratio method to measure samples Navi was used. For comparing, the average height of the navicular to the bottom of the third group; one-way ANOVA and to determine the correlation between BMI and height ratio Navi Pearson correlation coefficient was used in seven groups. The results showed that significant differences between the study groups were observed in the foot arch index. The results showed that the mean height of the vessel during athletes' samples showed different disciplines (swimming and running) there is a significant difference with non-athletes.

Keywords: arch of the foot, swimming, track and field athletes, non-athlete

Copyright © The Author(s). All Rights Reserved
Published by Open Access Publishing Group ©2015.

Introduction

One of the basic human needs in daily activities is having upper and lower limbs healthy (Aalami et al, 1997). Foot, is the foundation of the lower extremities. So the arch of the foot is used to transfer the body weight to the ground, it reacts to forces and absorbs them. Running, jumping and walking are made possible because their flexibility. In addition, arcs, nerves and vessels provide a place to pass and facilitate the distribution of blood flow and reduce fatigue (Dadgar et al, 2011). In addition to components such as leg bones, muscles and ligaments that have been organized accurately, foot shape is crucial in achieving this goal and any deviation from normal is not only reduces mobility but can be potentially pathogenic (Erfani, 2011 and Farahani, 2001). In connection with the arch of the foot are two types of bad direction (flat feet, deep foot), which are two of the most common foot problems. Part of complications related to abnormalities of the foot, the arch of the foot is a related task.

Obviously, in people with flat feet due to lack of natural arches absorbing the blows that spread from the foot do not take place. The forces exerted on the soles of the feet, the upper part of the body will lead to chain reactions in all body joints, especially the spine, lumbar spine (Gharakhanlou, 2005). Therefore, considering the importance of feet lower extremity kinetic chain, it is better that deformity of the foot arch to be accurately and early identified, because any delay in diagnosis, can determine clinical symptoms in older adults. In addition, it also will demand treatment that is far more aggressive and sometimes in severe cases, surgery will be avoided. Therefore, finding effective ways to reduce foot abnormalities and complications associated with them has always been of great concern.

This would only be possible if we can identify the range and level of natural anomalies as basis for judging normal or abnormal arch of the foot. Standardization provides evaluation, comparison and judgment on the quality and quantity improvement of individuals, because using it can be a scale for the community which provides assessing different parts of community, identifies strengths and weaknesses of community, and also provides access to a basis for comparison of communities (Gheytasi, 2008).

Despite the valuable benefits of regular physical activity, the risk of injury, particularly in competitive sports and championships, is an undeniable reality, and of those, more prone to sports injuries is the lower limb. The most important internal factors that tissue is susceptible to damage caused by the overuse; disrupting the natural alignment of joints and organs such as flat feet, ankle varus, genu, and anti-valgus deformity version (Dadgar, 2011 and Gheytasi, 2008). The status of arch is an important inner risk factors in the incidence of lower extremity injuries (Kapandji, 1999). Multi-function foot structures, such as absorption and distribution of ground reaction forces, as well as compliance with various levels and maintaining the stability of the foot, is dependent on the plantar arch. Of these, the longitudinal arch - interior has an important role in maintaining optimal performance feet (LetafatKar, 2009).

Arch is an architectural structure that integrates all the components of the leg joints, ligaments and muscles into a single system. Due to the curvature and the flexibility of the arch foot, the foot can adapt to the surface roughness, resulting from body weight and movement forces. This is important in many situations and is achieved by having the best mechanical advantage.

The arch of the foot takes blows and this mode is mandatory for flexibility while walking. So in an ideal foot, arches are designed to facilitate the taking of body weight under weight-bearing conditions. Therefore, any pathological state that softens or stiffens curves affect adversely keeping the body on the floor, running, walking, and maintaining stretched posture (MansoorPoor, 1998).

The human foot has a very complex structure with 26 major bones and with synovial joint become more than 30. Plantar arch has an important role in weight bearing and shock absorption during walking because only it is the only limb that been in contact with the ground during walking, so most pressure is applied to the sole of the foot (Morrison, 2007). It is the plantar arch of the foot to correct bearing weight, to provide weight distribution task, and to undertake and feet at the right time. Arch foot pressure distribution and mechanical deformation of foot arch is important (Murphy, 2003). In some studies, it has been shown that sport-specific exercises, repetitions and duration of exercise may have an impact on the arch of the foot (Rahimi, 2012). For example, the increased prevalence of flat foot in runners and skiers and transverse arch less than normal in footballers and tennis players (Klingl 1993) and reduced arch in different sports among athletes, gymnasts and wrestlers were observed. They showed that the basketball game may lead to an adaptation especially for arc foot teen players and a negative association has been reported between foot arch index and duration of training in basketball players.

Although some researchers have reported, the prevalence of flat foot in most of sports but still there is no available debatable evidence about the comparison of the incidence of flatfoot in runners without shoes and with shoes. Estakof (1991) and Wang (2008) in their study concluded that a runner with shoes have less twisting angle than barefoot runners and the more pronation angle that plays an important role in reducing the risk of injury.

They also stated that pain and local damage in the legs of runners may be associated with morphology and the pressure on the legs depends on the amount and direction of tilt legs. Given that the prevalence of flat foot, some researchers have reported in more sports but although it is believed that the peak plantar pressure in runners without shoes is more than runners with shoes but still there is no debatable evidence about the comparison of the incidence of flatfoot in sports without shoes and with shoes.

As noted above, although there are some researches on the relationship between the plantar arch and training in different sports agents and prevalence of flat foot in some of these researches but research about the comparison of the longitudinal arch of the foot in the field without shoes and athletic footwear for men has been not been conducted so far. The researcher, investigating the rate of the longitudinal arch of the sports without shoes and with shoes in athletes, aims in to answer the question of "is there any difference in the flatfoot in sports without shoes and with shoes?"

But so far, little research about the comparison of the longitudinal arch of the foot in the field without shoes and athletic footwear for men has not been conducted. Therefore, this study can show differences or possible differences in the amount of curvature athlete's foot with shoes compared with athletes without shoes in men's sports community sports in swimming and track and field.

Material and Methods

As the researcher studies on the basis of available facts and since the variable already existed in the sample, this study is a causal-comparative descriptive-field where researcher aims to examine the foot arch index in elite male in swimming and track-and-field and finally compare this information through inferential statistics so he can test the hypothesis. The population of this research was an was chosen from elite athletes branch man who has 5 years of experience in swimming and athletics who has professional training and non-athletes. People students participating in public physical education course in the second semester of the academic year enrolled 2014-15 were included. A statistical sample study of 80 elite was chosen between male athletes in swimming and track and field. 20 individuals were chosen from each. And 20, as well were chosen between non-athletes. The students participating in physical education classes Unit 1 Shahrekord University 2014-15 in the second semester of the academic year (as a control) were selected randomly.

A flat surface is selected near the wall. The test-taker has done all the footsteps by Ferryman method so that the test accuracy has the maximum accuracy. The footsteps of dominant leg, (right leg) were black using talcum powder on the screen. The footsteps of legs using talcum powder are recorded so that the samples were normal as standing position.

At the beginning of the test, 10 subjects were randomly selected from different groups and the footsteps are taken from each person and measure according to Staheli. First, subjects are asked to walk for about 15 seconds and then the screen was put under foot of the subject. The screen was put beside the wall so that the subject could keep his balance. Arch index is calculated by Staheli et al in the same way.

All amounts of foot arch index are measured and recorded to the nearest millimeter. Stock arch reference line is needed to accurately measure the width of the heel. To achieve this effect, lines on the soles of the feet was made using a soft pencil. A sharp reference line was drawn. Staheli was using two reference points set foot and any effect of these two lines is drawn. First, narrow the arc (MF) and the next step and the next step widest part of the heel (HR) is drawn. The precision of the lines based on subjective judgment and is the main source of error.

AI = MF / HR (foot arch index); the reader should note that the bigger the Staheli index number arch, the greater the arch width. In other words, arch height is less.

Navi ratio of height to foot length

Navicular foot blade can be found by touch method. A horizontal line is drawn on most bumps (bumps NAVI) and the height of the vertical line to the ground is measured using a ruler. When participants stand in a normal situation, Navi is measured after measuring the effect of foot height measurement. All measurements would be done by test-taker. To get the most posterior leg length distance between the most anterior point of the heel to the big toe points, the standing position is to be measured (Morrison, 2005).

For the purpose of this study, two measuring tools should be used. Staheli foot arch index system, as has repeatedly been the basis of much research about MLA which represents a range of indicators arch forms during adulthood. As House et al (1992) did not give more authority approved the foot arch index. For this reason, the vertical height of the navicular tuberosity is used to measure the Earth's surface, which is a new tool for measuring arch height and easily used at any location, the type of measure approved by Müller et al (1993) was used. The final height is divided by the length of the leg, so that the index is obtained according to the feet length.

Statistic Methods

To display data such age, weight, height subjects of descriptive, statistic methods are, and to review significant amount of research hypotheses, inferential statistics will be used, that is, to evaluate the difference in navicular height and arch index among different athletes and normalizing the data to compare each, one-way ANOVA and for the correlation or association between BMI and the amount of foot arch index and navicular height between different athletes and the normality of the data, the Pearson correlation coefficient alpha level of 0/05 will be used by qualifying the test. Tables and graphs are done using Excel software and statistics operations are carried out by the SPSS software.

Results

Subjects Profile

All specifications and features obtained from subjects by measuring and personal information form is presented in Table 1 and following charts:

Table 1: Mean and standard deviation of the groups studied

Non-athletes	Swimming	Track & filed	sports / variable
158 + 4.5	166 + 3.8	168 + 4.9	Height (cm)
59.4 + 11.5	56.5+7.1	55.5+5.1	Weight (kg)
24 + 3.1	19.1 + 2.1	21.6 + 2.6	Age (years)
22.4 - 3.1	19.89 - 3.2	20.89 - 5.6	BMI
0.22+0.59	0.17 + 0.23	0.17 + 0.7	Navicular ratio of height to foot length
0.7 + 0.63	0.7 + 0.33	0.65 + 0.1	Foot arch index
20	20	20	number

Testing hypotheses

To determine the significance of the average of the data groups, the analysis of variance (ANOVA) was used to determine which of the means are significantly different from Tukey post hoc test was used.

This finding is as follows:

Testing Hypothesis 1: The mean there is no difference between research groups in the foot arch index.

To test the hypotheses that (1) the analysis of variance was used to test results in Table 2 below.

Table 2: ANOVA statistical index

Significant situation	P values	Standard deviation	Average AI	Statistical Indicators ANOVA / sports
Confirming null hypothesis	0.962	0.21	0.64	Track & field
		0.34	0.70	Swimming
		0.62	0.72	Non-athletes

According to the data in Table 4-2, foot arch index in three groups at a significance level (a = 0.05) was not significant.

Testing Hypothesis 2: The mean ratio of height to foot length Navi, there is no difference between study groups.

To test the hypotheses that (1) the analysis of variance was used to test results in Table 3 below.

Table 3: ANOVA statistical index

Significant situation	P values	Standard deviation	Average AI	Statistical Indicators ANOVA / sports
Rejecting null hypothesis	0.000	0.5	0.17	Track & field
		0.32	0.15	Swimming
		0.79	0.23	Non-athletes

According to the data in Table 3 feet long, three-level height ratio Navi (a = 0.05) were significant.

In order to determine the location of the Tukey's test was significantly different between the groups that statistical results of this test are presented in Table 4.

Table 4: Tukey Test

Results of mean comparison	Significance level	Comparing sports
Not significant	0.732	Swimming - Track & field
Significant	0	Swimming - non-athletes
Significant	0.002	Athletics - non-athletes

Tukey test according to Table 4 shows that:

1. Navicular height ratio is 1 foot, long swimming groups and non-athletes (0 = P) There is no significant difference.
2. Navicular height ratio to the length of the leg between the two groups and non-athletes (002.0 = P). There is a significant difference.

Testing Hypothesis 3: The mean BMI index and the index of foot arch, there is no relationship among research groups.

To test the hypothesis (3) of Pearson's correlation coefficient was used. The results of this test are shown in Table 5.

Table 5: Pearson correlation analysis

Significant situation	P values	r	Statistical Indicators ANOVA / sports
Rejecting null hypothesis	0.569	0.54	Track & Field
	0.699	0.92	Swimming
	0.435	0.185	Non-athlete

The mean BMI and mean plantar arch index relationship does not exist between in the groups.

Testing Hypothesis 4: The mean BMI index and the index of foot arch, there is no relationship among research groups.

To test the hypothesis (3) of Pearson's correlation coefficient was used. The test results are shown in Table 6.

Table 6: Pearson correlation analysis

Significant situation	P values	r	Statistical Indicators ANOVA / sports
Rejecting null hypothesis	0.996	0.010	Track & Field
	0.855	0.440	Swimming
	0.961	0.012	Non-athlete

BMI index and the ratio between the navicular height and foot length relationship do not exist between the groups.

Discussion and Conclusion

As previously noted significant differences between the study groups was observed in the foot arch index. In other words, there is a significant difference in the rates of plantar index in swimmers.

In this regard, the results of this research is consistent with the study doctor Alizadeh as the physical condition of athletes and Shahrekord University team and comparing it with the physical status indicator and provide training, corrective exercise, in the absence of a significant amount of flat foot is consistent in different fields. Alizadeh in his study, reached to almost a mean of Shahrekord University athletes.

The results of this study with research are incompatible with Yadog et al (2005) stating that the arch is different in different sports and athlete's foot arches less than non-athletes.

The reason for this discrepancy can be due to the difference average experience of the present of athlete's samples with the present study. It is, also, due investigating the right and left flat foot in this study which the average right and left is examined in the present study.

If we look at the track record of previous studies, it should point out that in relation to the amount of foot arch index in sports with and without shoes no independent investigations found but snickers (1995) in their study on plantar pressure pattern when subjects running shoes when running without shoes concluded that barefoot runners significant difference in peak plantar pressure when running with shoes on. If, according to the findings peak plantar pressure in barefoot runners may end up being more affected foot. So, this assumption is incompatible with the results of this study and further researches are discussed in this regard. Finally, due to the lack of research in this area needs further study to meet the studies outlined in this section.

The findings of this study showed that there is a significant difference between the groups in other words the average ratio of height to the length of the various disciplines samples Navi athletes (swimming and running) there is a significant difference with non-athletes. These results Kltanan (2004) is consistent. Kltanan in his research on athletes and non-athletes concluded that the foot is more smoothness than non-athletes.

The results of Idol (2005) also stated the fact that athletes foot longitudinal arch is less consistent than on non-athletes. Commenting on the findings of the two studies like this can be said that the normal daily activities that require your feet should always bear the full weight of the body.

It needs to be doubled in sports activities. In exercise and high contact, pressure with the ground leg of body weight should be 3 to 4 times in the legs - and shoes to be distributed. When exposed parts of the body are caused by overuse and repetitive body parts - bones, muscles and soft tissues. In this regard, Kayano (2003) in a study examining the dynamic performance as the medial longitudinal arch of the foot with a comprehensive study on the factors affecting the rise and fall of the arc, foot part of the musculoskeletal system which handles the receipt and distribution of body pressure during walking, jumping, and running is bound, concluded that dynamic changes arch under complex conditions with changes in body weight, bone structure, ligaments and muscle forces are affected. Most forms of exercise include running and jumping, which causes high pressure in the lower extremities. So much exercise, too much pressure on the lower limbs and feet, for example, the placement of the feet on the ground when the pressure of exercise 2 to 3 times body weight. For example, a runner can put their feet on the ground 5000 times per hour each. This means that if there is a slight deviation in the normal or proper running techniques, problems are demonstrated by too much pressure on the soles of the (Ghrakhanlou, Daneshmandi, Alizadeh 83).

According to what stated above, activities are more active than non-athletes and high repetition and practice the mechanism is too much pressure on their feet (Morimoto and Aokad 1987). So we can anticipate that this pressure can cause the reduction of athlete's foot longitudinal arch. The overuse of limbs in athletes can repeat overload and inability to absorb shock in the legs, the inability to absorb shock in the legs about a foot structure especially the foot longitudinal arch height (Los 2005). But there was no significant difference between the average ratio of height to length. In other words, there was no significant difference between the average ratio of height to foot length in sports (swimming and running). Given that some studies have shown that in sports without shoes, peak plantar pressure is more than sports footwear and shoe is an operating pressure distribution, but the study did not show a significant difference that id due to the lack of difference in a few sample (n = 20) that most of them were not accessible or due to the low professional experience in the current study. The results of the present study is also inconsistent with Klingel's (1993) because Klingel stated that there is a relationship between certain sports and anomalies of lower limb that is probably due to the lack of consistency of the methods of measurement and population.

References

1. Aalami Harandi B, Mortazavi SMJ. (1997). An Epidemiologic Study of Flat Foot in Iran. Tehran Medical University Journal, 55(3-4), 78-83 [In Persian].
2. Dadgar H, Sahebozamani M. (2011). Evaluation of sole arch index and non-contact lower-extremity injury rates in male karateka. Journal of Research in Rehabilitation Sciences, 7(1),1-8 [in Persian].
3. Erfani M, Sahebozamani M, Marefati H, Sharifian E. (2011). The survey of sole arch index and its relationship to non – contact ankle sprain in athletes. Journal of Sport Medicine, 2(3), 99-112 [in Persian].
4. Farahani A. (2001). Corrective exercises. Tehran: Payame Noor University Pub, 94-100 [In Persian].

5. Gharakhanlou R, Daneshmandi H, Alizadeh MH. (2005). Prevention and treatment os sport injuries. 1st. Tehran: Samt Press, 489-98 [Persian].

6. Gheytasi M. (2008). Is Q-angle a predictor of knee ligament and meniscus injury in elite wrestlers? Thesis. School of Sport Medicine. Tehran, Iran: University of Tehran [Persian].

7. Kapandji IA. (1999). Kinesiology of lower extremity joints. Translate by: Mostofi MS, Eyvazi Garamolki M, Sobhani AGH. Tabriz: Salar Press, 244 [Persian].

8. LetafatKar KH, Bakhsheshi Haris M, GHorbani S. (2009). Corrective exercises and Therapy.1st ed Tehran: Bamdad Ketab, 142-150 [In Persian].

9. MansoorPoor k. (1998). Study of medial longitudinal arch for Determination of Intensity flat foot by using these two ways: Bony Londmarks & Foot Print., the 9th Iranian physical therapy congress of Iran May 11-13 Tehran, 14-16 [In Persian].

10. Morrison KE, Kaminski TW. (2007). Foot characteristics in association with reinversion ankle injury. J Athl Train. Jan-Mar, 42(1), 132-135.

11. Murphy DF, Connolly DA J, Beynnon BD. (2003). Risk factors for lower extremity injury: a review of the literature. Br J sport Med, 37, 13– 29.

12. Rahimi M, Halabchi F, Alibakhshi E, Kalali N. (2012). Sport injuries of Karatekas at international competitions. J Mil Med, 13(4), 120-129 [in Persian].

13. Razeghi M, Batt ME. (2002). Foot type classification: a critical review of current methods. Gait Posture. Jun, 15(3):282-91.

14. Sepasi H, Norbakhsh P. (1997). Measurement and Evaluation Physical Education. Tehran: Samt, 204-207 [In Persian].