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Original article:

Comparison of gait parameters between normal foot and flat foot in young adult females

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Abstract:

Objective: To find the Spatial parameters by using foot print analysis method ,Temporal parameters by 3m walk test, Navicular drop for finding the difference between the normal and flat foot in age group between 18-25 years.

Methodology: We included 60 students with two groups out of which 30 were with flat foot & 30 were with normal foot and we took measurements to evaluate difference between spatial and temporal variables among flat and normal foot.

Results: There is no such difference between spatial and temporal gait parameters except Degree of Toe Out . We found a major difference between degree of toe out among flat & normal foot.

Conclusion: It can be concluded that there is not any difference between the stride length , step length, step time ,stide time and step width but there is difference in degree of toe out between normal foot and flat foot of young adult females.

Keywords: Foot print Analysis method , 3-M walk test

Introduction:

Human body , or gait described as a translatory progression of the body as a whole , produced by coordinated , rotatory movements of body segments. (Norkins, 2005).Shultz describes gait as “someone’s manner of ambulation or locomotion that involves that body.

It is a fundamental unit to describe the gait during ambulation , which occurs from the time when the heel of one feet strikes the ground to the tie at which the same foot contacts the ground again (heel strike of one foot to the gain heel strike of the same foot).(Norkins, 2005).The gait cycle consists of two phases : Stance and Swing phase.

Variables of gait

Time and distance are two basic parameters of motion (Norkins ,2005)

Temporal variables

i. Stance time
ii. Single-limb and double-support time
iii. Swing time
iv. Stride and step time
v. Cadence
vi. Speed

Distance variables

1. Stride length
2. Step length
3. Step width
4. Degree of toe out

Flat Foot (Pes Planus)

Pes planus (flat foot) is a condition in which the foot has a visibly lowered medial longitudinal arch.

Foot arches

The foot has three arches :

Two Longitudinal (medial and lateral) arches and One Anterior transverse arch.

These arches are formed by the tarsal and metatarsal bones and are supported by the ligaments and tendons in the foot.

Medial Arch

The medial arch is the higher of the two longitudinal arches . It is made up by the calcaneus, the talus, the navicular, the three cuneiforms, and the first, second, and third metatarsals. The chief characteristic of this arch is its elasticity, due to its height and to the number of small joints between its component parts.

Lateral Arch

The lateral arch is the flatter of the two longitudinal arches, and lies on the ground in the standing position. It is composed of the calcaneus, the cuboid, and the fourth and fifth metatarsals. Its summit is at the talocalcaneal articulation, and its chief joint is the calcaneocuboid, which possesses a special mechanism for locking, and allows only a limited movement.

Transverse Arch

In addition to the longitudinal arches the foot presents a series of transverse arches. The transverse arch is located in the coronal plane of the foot.

Aim of the study:

The aim of the study is to find out the comparison of gait parameters between the normal foot and flat foot in young adult female.

Objective:

To find the Spatial parameters by using foot print analysis method ,Temporal parameters by 3m walk test, Navicular drop for finding the difference between the normal and flat foot in age group between 18-25 years.

Material and Methodology:

Study design: The study design used is comparative study.

Sampling: The sampling method used is sample of convenience.

Sample size: The sample used is 60

Study duration: One time

Inclusion criteria

The age group of the subjects included in the study was 18-25 years.

The subjects were with random weights (no specific classification).

The subjects that were included were with normal foot and flat foot.

Exclusion criteria

The subjects excluded from the study if they had,

Any lower limb deformity, bony abnormality, any joint infection.

Any recent surgery in lower limb past 6 month.

Any recent fractures in lower limb past 6 months.

Leg length discrepancy, any pain , arthritic pain.

Any neurological disorder.

PROCEDURE:

- Subjects were recruited through sample of convenience.
- Subjects were selected after matching the inclusion and exclusion criteria. Inform consent form was obtained , procedure and purpose was explained to each individuals prior to study.

For gait parameters

- Foot print analysis method was used for gait parameters . Water soluble red color was applied to the planter surface of both the foot. The subjects were instrumented to walk along the walkway. If they hesitated or no imprint was obtained , the trial is repeated.
- From the second foot print , three consecutive footprints will be evaluated , for gait readings.

Measuring of navicular drop :

The measurements of navicular drop was measured in standing position with bringing the talus into neutral position .then measure the distance from the ground to the tuberosity and mark it on a piece of paper,now ask your subject to bear weight on the foot and measure the distance from the ground to the tuberosity again and mark it on the same paper.with this test the distance obtained on the paper is your navicular drop .(Brody 2005) .

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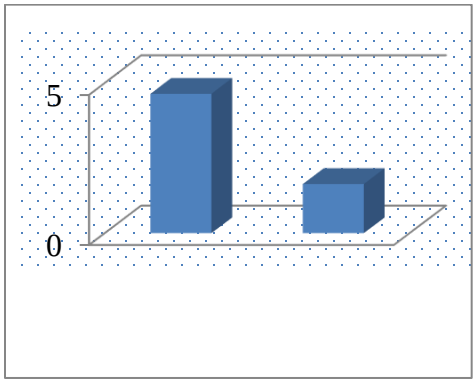
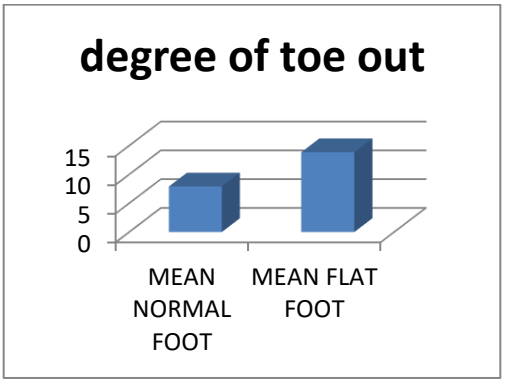
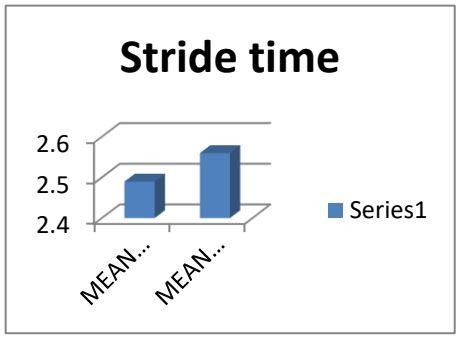
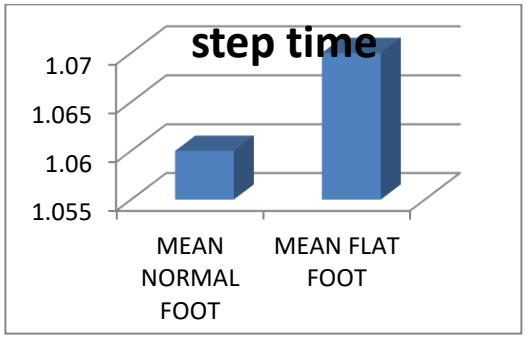
RESULT:

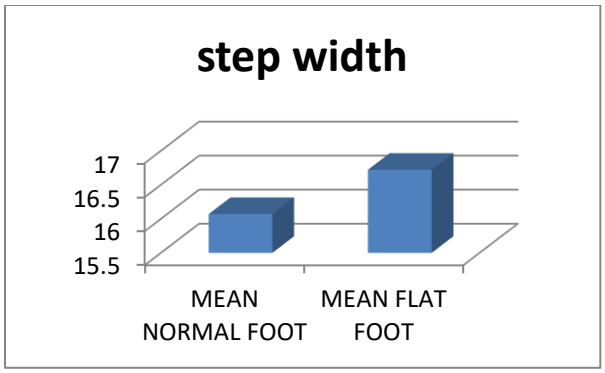
	MEAN±SD (NORMAL)	MEAN ±SD (FLAT)
Navicular drop (mm)	4.64±1.06	1.64±0.57
Stride length (cm)	43.37±2.71	44.00±3.44
Step length (cm)	18.22±3.24	19.86±2.93
Step width (cm)	16.07±3.97	16.72±2.97
Stride time (sec)	2.49±0.41	2.56±0.53
Step time (sec)	1.06±0.28	1.07±0.34
Degree of toe out	7.31±0.87	13.86±1.73

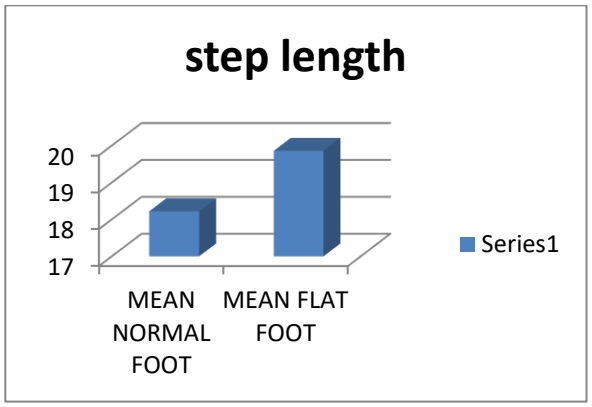












DISCUSSION:

The purpose of the study was to determine the comparison between gait parameters of normal foot and the flat foot in young adult females.

The study was conducted on 60 subjects out of which 30 were flat foot and 30 were normal foot subjects . The readings were taken and analysed by using formulas of Airthmetic Mean and Standard Deviation. As per the study conducted , there was a difference in the mean value of Navicular drop and the Degree of Toe-Out but not in between the stride time, stride length, step width , step length and step time .There was an increase in degree of toe out with increase in weight in flat foot of young females.

There is strong difference found between the degree of toe out in flat and normal foot but there is no difference found between the other spatial and temporal variables including stride length , step length, step time, step width and stride time of normal foot and flat foot.

Schiew and Andrew(2000) suggested a link between overweight and flattening of arches. Hall and Broody (1999) also concluded about overweight that has excessive pronatory effect. Overweight subjects shows greater angle of turn out because they have high foot flare while waking (Charette 2002).

Steven et al (2004) also concluded that overweight can contribute to excessive pronation and foot pain .

Kendall 1993, conclude that in weight bearing position, longitudnal arch gets flattened which is accompanied by Out-Toeing.

There is greater calcaneal eversion found in subjects with overweight, which inturn causes reduced active range of motion of ankle dorsiflexion (Megha Masaun 2009). The compensation for reduced ankle dorsiflexion takes place at the subtalar and midtarsal joints in the form of excessive pronation.

It prooves that the increased weight gives affect on calcaneal eversion and hence on angle of toe-out. This is because overweight puts stress on the foot causing flattening of arches, Kapandji (1985) . Severly obese females have significantly greater rearfoot motion and foot angle values than the nornal weight females which can lead to certain dysmorphism of foot specially flat foot.

With the found readings it can also be concluded that with the increase in the weight of girls there is increase in degree of out . The study was not targetly done on overweight females who was with flat foot . The findings of this study show that a inceased weight can influence foot characteristics which can further predispose the indivisuals to musculoskeletal pain.

Limitations of the study

- The sample size used was small .
- There was targeted walking by the subjects which altered the variables.

Future scope of the study

- Determination of the other gait parameters like Cadence , Basal support in flat foot females.
- Various age groups can be studied with the flat foot affecting ADL's , Running speed of the indivisuals .
- Comparison of same study can be conducted between the males and females of same age group with flat feet.

CONCLUSION:

On the basis of the result of study it can be concluded that there is not any difference between the stride length , step length, step time , stide time and step width but there is difference in degree of toe out between normal foot and flat foot of young adult females.

The difference in the angle of toe out was due to the overweight of the indivisual present with flat feet. This is because the overweight puts stress on the foot causing the flattening of the foot arches . overweight has excessive pronatory effect and subjects shows greater angle of turn out because they have high foot flare while waking.

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