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"Correlation of Navicular Drop and Medial Foot Angle in Flat Foot People with Age 25 to 60"

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ABSTRACT
Background: Flatfoot refers to a condition where the arches on the inside of the feet flatten when standing or walking, causing the entire sole to make contact with the ground. This condition can affect one or both feet and can occur at any age. While some individuals with flatfoot experience no symptoms, others may suffer from pain, swelling, and difficulty with movement, especially after prolonged activity. Flatfoot can be congenital, meaning present at birth, or acquired over time due to various factors such as injury, arthritis, obesity, or the natural weakening of the tendons that support the arch.
Method:Thirty adults of age group 25 to 60 years voluntarily participated in this study. To calculate ND first patient's navicular tuberosity was marked with a pen while patient was sitting or standing and talus is in the neutral position (normal angle), the distance was measured from the ground to the tuberosity and mark it on a piece of paper with the help of blank paper, ink, short-arm goniometer, butter paper, graph etc. and the data was analysed. Decreased ND leads to the low MLA which has been determined to be risk factors.
Result: The Right Weight Bearing Angle among subjects is between 109-133, the Left Weight Bearing Angle among subjects is between 110-140, the difference between RNA and RWBA ranges between 2-13 ,the difference between LNA and LWBA ranges between 1-20 the Right mid- point width (mm) ranges between 54-88, the Left mid-point width (mm) ranges between 60-92, the Right Heel width (mm) ranges between 59- 74, the Left Heel width (mm) ranges between 59-74, the SI of Right leg ranges between 0.8615384-1.33846154, the SI of Left leg ranges between 0.810810811-1.295774648.

I. INTRODUCTION

Flatfoot refers to a condition where the arches on the inside of the feet flatten when standing or walking, causing the entire sole to make contact with the ground. This condition can affect one or both feet and can occur at any age. While some individuals with flatfoot experience no symptoms, others may suffer from pain, swelling, and difficulty with movement, especially after prolonged activity. Flatfoot can be congenital, meaning present at birth, or acquired over time due to various factors such as injury, arthritis, obesity, or the natural weakening of the tendons that support the arch.

Flatfoot is a prevalent condition impacting 2% to 23% of adults. This condition is marked by the Some or the complete dysfunction of the Medial Longitudinal Arch (thereafter referred as MLA) . These alterations in foot structure are linked to changes in the kinematics of the lower extremities during dynamic movements. Flatfoot's effect on the MLA leads to significant deviations in the way the lower limbs function, particularly during activities that involve motion. For optimum bodily function and overall health, the way the foot arches move and is structured, plays a vital role. The MLA, which serves as the foot's main shock-absorbing structure, is a crucial component of foot function [3].

During walking, the MLA is crucial for energy transfer and stress absorption. The formation of MLA is discovered to be influenced by race, age, gender, and footwear, whereas Arch Function is influenced by the structure of the foot, bona, muscle etc. [M Papuga et al]. Several researches conducted on this theme indicates that 77 percent of individuals with flat feet experience back or lower extremity issues【Lee, M.S.Vanore】.

Navicular drop

Navicular drop (thereafter referred as ND) refers to the decrease or increase in the length of the navicular bone when transitioning from a non-weight-bearing subtalar neutral position to a weight-bearing relaxed stance. This measurement

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serves as an indicator of foot pronation. Specifically, it denotes the distance the navicular bone descends when the subtalar joint moves from a neutral position to a relaxed state while standing [4].

One of the significant issues in adult health practice is the flatfoot. The condition varies in severity and is characterized by forefoot abduction and several other issues. This leads to the entire sole of the foot touching completely or making some reasonable degree of contact with the surface. Overuse can result in muscle tension and cramps in the foot and leg.

This study demonstrates a way to measure feet without using special expensive equipment. Th e aim of this study is to deduce the co-relation that is existing between Foot characteristics and footprint measurements an d to predict flatfoot measurement based on think pa d using footprints. Finally, features of flat feet that cannot be detected by footprints are determined.

MATERIAL AND METHODS

Thirty healthy young adults, males and females of age group between 25 to 60 years voluntarily participated in the study. They were recruited according to the inclusion criteria. The consent form was signed by each participant before the test. The procedure and instructions were explained to each participant and demonstration test was done prior to the actual test to avoid any error.

After the consent forms were signed their SI and ND was evaluated. To calculate ND first patient's navicular tuberosity was marked with a pen while patient was sitting or standing and talus is in the neutral position (normal angle), the distance was measured from the ground to the tuberosity and mark it on a piece of paper with the help of blank paper, ink, short-arm goniometer, butter paper, graph etc, and the data was analyzed. Decreased ND leads to the low MLA which has been determined to be risk factors.

With the help of these tools, footprint was taken on blank paper and using butter paper, the outline of the footprint was drawn on a graph paper for respective subjects for both the feet. On the graph, the width of the central region (A) and heel width(B) was measured to calculate the SI. SI is most commonly used for clinical diagnosis of subject using footprints. It is calculated by dividing the mid region width by heel region width [14].

Staheli Index = A/B

II. RESULT

From the study, we have these results:

- Total number of subjects taken is 30.
- The age limit taken is between 25-60.
- Out of which female subjects are 18 and male subjects are 12.
- The weight range is between 48-90 Kgs.
- The Right Normal Angle is found to be between the range 114-147
- The left Normal Angle is found to be between the ranges 115-150.
- The Right Weight Bearing Angle among subjects is between 109-133
- The Left Weight Bearing Angle among subjects is between 110-140.
- The difference between RNA and RWBA ranges between 2-13
- The difference between LNA and LWBA ranges between 1-20
- The Right mid- point width (mm) ranges between 54-88.
- The Left mid- point width (mm) ranges between 60-92.
- The Right Heel width (mm) ranges between 59- 74
- The Left Heel width (mm) ranges between 59-74
- The SI of Right leg ranges between 0.8615384-1.33846154
- The SI of Left leg ranges between 0.810810811- 1.295774648

Hence, Key correlations include:

- That RNA and RWBA has a strong positive correlation of 0.959706
- Right-Mid Point Width(mm) and R-SI: 0.887101 (strong positive correlation)
- Left-Mid Point Width(mm) and L-SI: 0.861507 (strong positive correlation)

Negative correlations can also be significant, such as:

- Change(Right) and Right-Mid Point Width(mm): -0.669505
- RNA(and Left-Mid Point Width(mm): -0.620158

➢ Average age of the population=(Sum of the ages/total no of people)
= 2257/30 = 75.23 Kg

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Table 1. Characteristics of participants

	Subjects	Male	Female
No. of participants	**30**	**12**	**18**

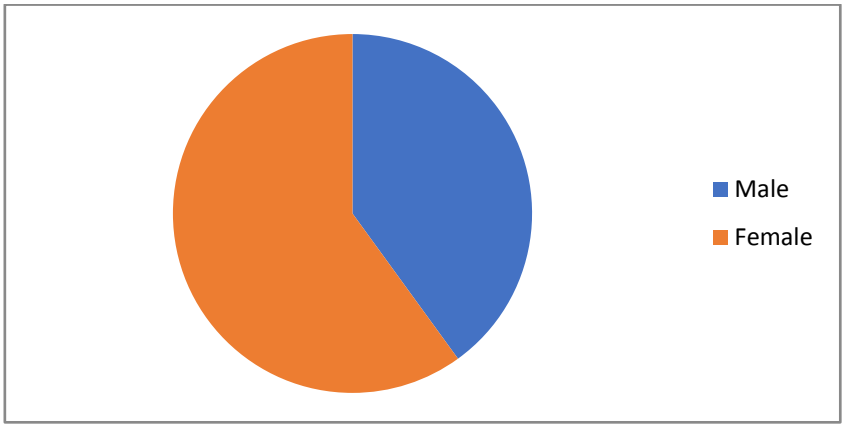
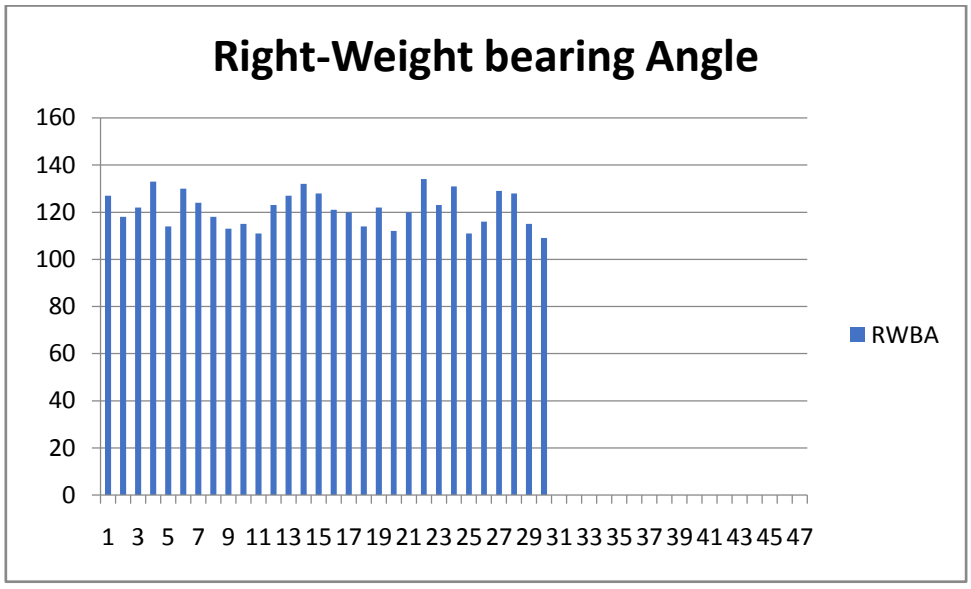


Chart 1: Male and Female Ratio

Male	12 (40%)
Female	18(60%)



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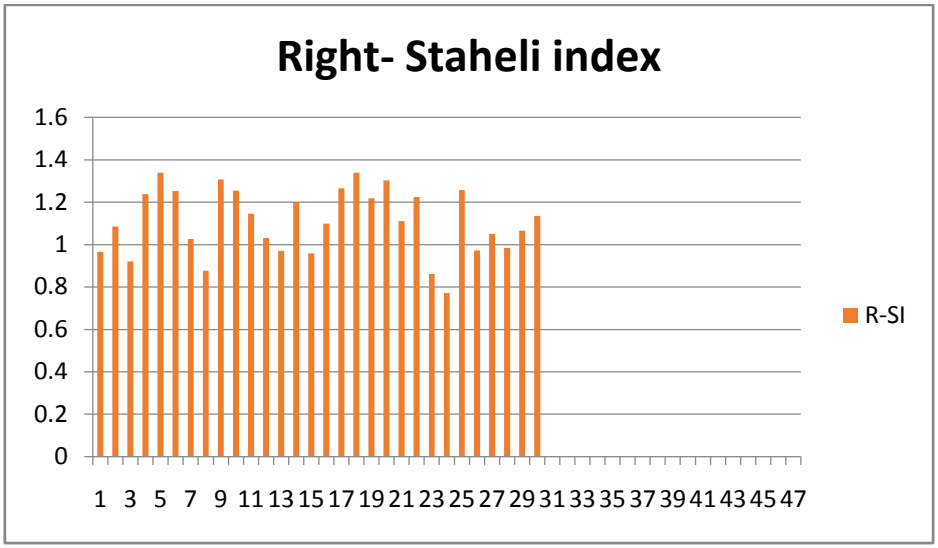
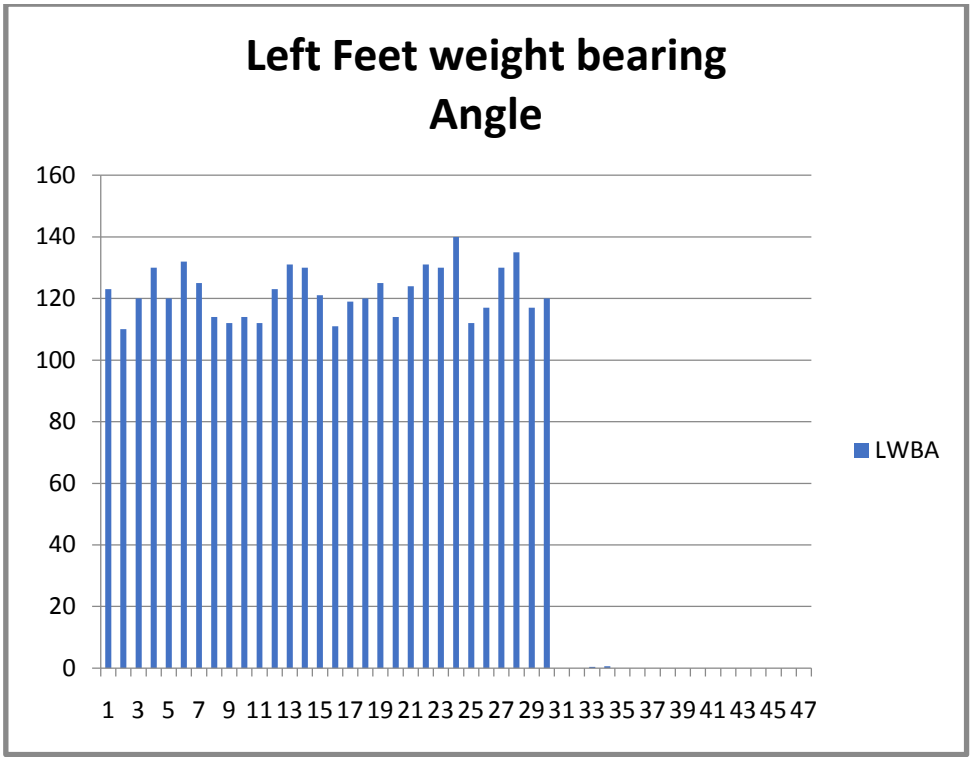


Chart 2: Relation between Weight bearing Angle measurement and SI calculated from Right feet impression.



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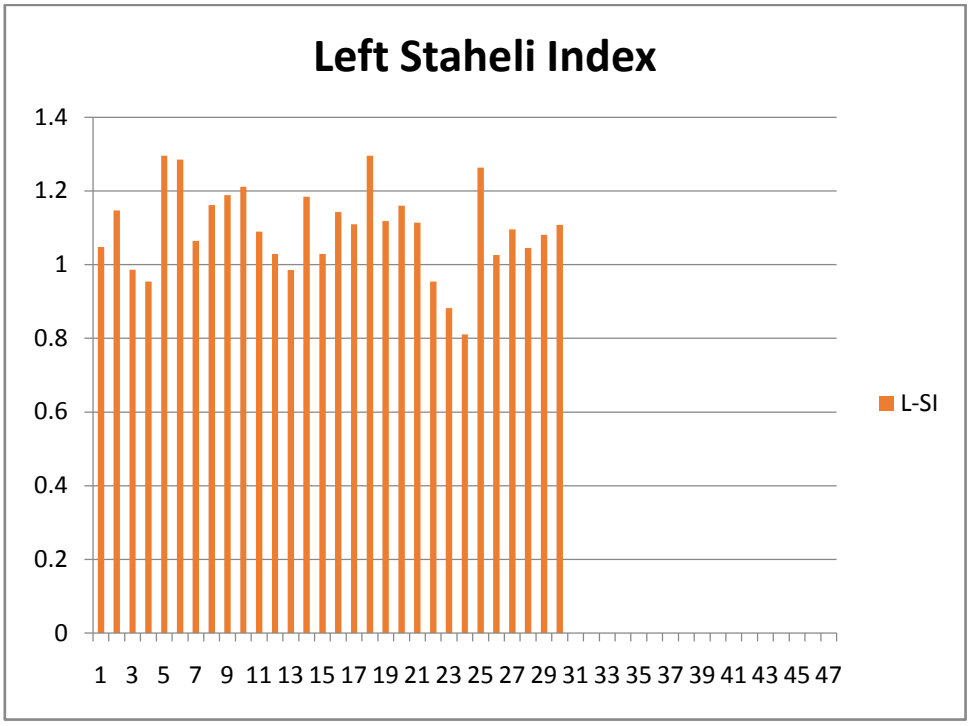

Chart 3: Relation between Weight bearing Angle measurement and SI calculated from left feet impression.

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