ORIGINAL ARTICLE

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NORMATIVE VALUES OF THE FOOT LINE TEST IN PHYSIOTHERAPY STUDENTS: A CROSS-SECTIONAL STUDY

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ABSTRACT:

Background: A large variety of methods have been developed to classify the foot based on structure and alignment. Foot line test is one among them use to find out the influence of load carriage and musculoskeletal injuries that may be associated with an increased vertical ground reaction force. It helps to understand that the position of the medial prominence of the navicular, in a Mediolateral direction, would provide additional relevant information describing the amount of pronation. The aim of this study is to find out the normative values of the foot line test in physiotherapy students and to find out its correlation with BMI and the correlation between foot length and height of physiotherapy students. **Methods:** It's a cross-sectional study in which 60 subjects are included with free of a foot injury and musculoskeletal problem to lower limb. With participants in the standing position the first MTP joint and navicular tuberosity were marked on the paper. The foot line test was drawn in MTP joint and navicular tuberosity. **Results:** Results show that normative values for the right foot were ranging from -5 to +8 while that for the left foot was ranging from 0 to 5in males. The normative values for the right foot were ranging -3 to +3 while that for the left foot was ranging from0 to 4 in females. The correlation between BMI and right foot was positively correlated for the left foot it was negatively correlated. Correlation between foot length and height is positively correlated. **Conclusion:** The study result shows that the normative value of males which is found to be ranging from -5 to 8 and for females ranging from 0 to 5. For left foot normative values for males is ranging from -3 to 4, and for females, its 0 to 4. Correlation of foot length and person height is positively correlated, and the correlation of BMI is positively correlated with the right foot, negatively correlate with the left foot.

Keywords: Foot line test, metatarso-phalangeal joint, body mass index, flat foot

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INTRODUCTION

The feet are the foundation of our bodies, and they assist us in some of the most basic functions of living. Through activities of living, the feet can change structurally over time, causing a misalignment of the feet such as flat foot, pes planus, and cavus. In addition, the feet are susceptible to infections—including bacterial, fungal, and viral infections. Systemic illnesses can also affect and change the feet, which can limit daily activity and quality of life.

Foot assessment is a common approach in clinical practice for classifying foot type with a view to identifying possible etiological factors relating to injury and prescribing therapeutic interventions.[1]This assessment forms the basis of foot evaluation, their structural alignment, or position of the foot, is used to infer characteristics of dynamic foot function, and theoretically establish injury mechanisms leading to pathology. This model of foot function is primarily derived from the work of Root et al., who proposed static assessment measures to enable clinicians to identify deviations from a normal ideological foot[2].

The foot line test is a simple technique and uses less instrumentation to assess for foot alignment. It gives variable information regarding foot position[2]

There are a large number of tests available, but the exact relationship between foot morphology and injury development is not known. Many authors found the position of the medial prominence of the navicular, in a mediolateral direction, would provide additional relevant information describing the amount of pronation. However, there is test such as naviculr drop test and FLT which help to found and measure the position of the medial prominence of the navicular in a mediolateral direction exists[.3]

This study plays an important role in calculating the normative values and also helps to identify the problem related to the foot and deformities of the foot,there is a number of factors that is influencing the foot line measurements. the normative value of FLT changes as the structure of foot varies from person to person and also from countries to countries we must know the benefits for our population.[2]

This study plays an important role in calculating the normative values; hence, this study was undertaken with the aim of to find out the normative value of FLT and correlation between foot line and BMI, also between foot length and height.

METHODOLOGY

The study conducted on 60 physiotherapy students according to inclusion and exclusion criteria. It was a cross-sectional study with the purposive sampling method

Inclusion criteria were both genders with the age group of 18-26 years and who were willing to participate in the study. Exclusion criteria were an injury to the foot (recent fracture, sprain), any neurological problem in Foot, Congenital foot deformities, Unable to go in a weight-bearing position.

The outcome was used for the study were foot line test for that Foot line instrument, and A4 size paper are used

PROCEDURE

Approval was taken from the Institutional Ethical Committee, and all participants were explained about the proposed benefits, risks, and procedures involved in the study, in a language best understood by them. An initial foot assessment was taken for any exclusion.

Procedure for Foot line test: This study plays an important role in calculating the normative values and also helps to identify the problem related to the foot and its deformities. There are a number of factors which is influencing the foot line measurements

Foot line test helps to find out the relationship between foot morphology and injury development. It measures the frontal plane position of the navicular in relation to a static reference line connecting the forefoot and hindfoot. It's a reliable and valid test with ICC value 0.94-0.95.

The test was performed with the subject standing with weight equally distributed on both feet. A piece of paper has placed under the foot to be measured. The medial border of the foot was projected onto the paper with a marker (fig.1). This marker has 2 points of contact with the ground to ensure that the projection was perpendicular to the paper (fig.2)and has a height of 5.5 cm. This height is short enough to allow the marker to pass under the medial malleolus, yet high enough to reach the tuberosity of the navicular.

The location of the first metatarsophalangeal joint (MPJ) and the tuberosity of the navicular, was identified through palpation and was marked on the paper (fig3).Subsequently, a static reference line will draw from a projection point located 3 cm posterior to the first MPJ to a projection point 5 cm posterior to the navicular (fig4) we measured the distance from these point which is 3mm.

Fig 1: Placement of foot for foot line test

Fig 2: placing a medial border of the foot on the paper with FPI instrument

Measurement: The static reference line starts from the 1st MTP joint, and the point of the navicular tuberosity. It

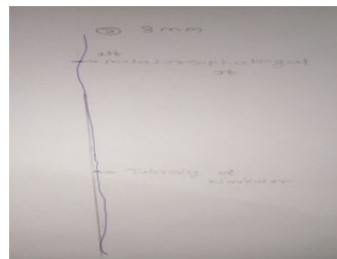**Fig 3:** an instrument for measuring FPI

Fig 4: Measuring the distance between the reference line and medial border of foot at navicular tuberosity.

was proximal to the first MTP to avoid any medial displacement caused by the bulging of the first MTP, and the posterior point defining the static reference line was proximal to the navicular bone to ensure that it was not affected by the position of the navicular.

The distance between the static reference line and the medial foot border at the point of the tuberosity of the navicular was measured in millimetres. A positive value will be noted when the foot border will be medial to the connecting line.

RESULT

The result was analyzed using Microsoft excel and SPSS 24

Table 1. Baseline characteristic of participants

Mean	Age (Yr)	BMI (Kg/m²)
Males (n=5) 8.3%	20.1 ±3.008	20.28 ± o.75
Female (n=55) 91.6%	20.7 ±2.93	20.72 ±2.65

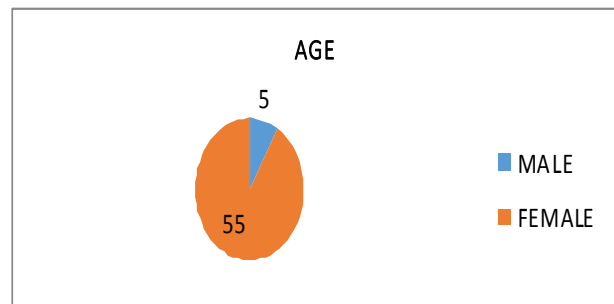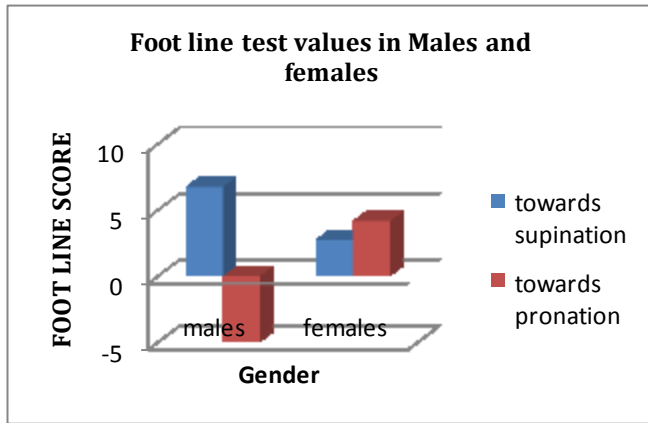From table 1 Total number of males were n=5 (i.e., 8.3%) and the total number of female was n =55(91%).

Fig 5. Pie chart showing gender-wise distribution.

Table 2. Footline score of left and right foot

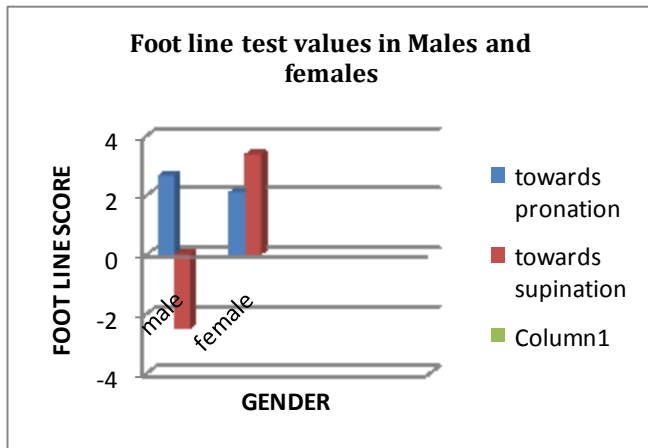|	Right footline score		Left footline score	
	Towards supination	Towards Pronation	Towards supination	Towards Pronation
Males (n=5)	+/-6.75	+/-5	+/-2.66	+/-2.5
Female (n=55)	+/-2.74	+/-4.15	+/-2.10	+/-3.37

Table 2 shows the footline score of male and female with left and right foot, and it's is showing that negative value above -5 is towards pronation while a positive value above 8 is towards supination.

Fig: 6 Comparison of Foot line test between Right foot

Foot line test values in Males and females

This graph showing males have normative foot values ranging from -5 to +8 while that of females ranging from 0 to 5.

Fig: 7 Comparison of Foot line test between Left foot

Foot line test values in Males and females

In the above group, normative values of males are ranging from -3 to +3 while those in females it's from 0 to 4.

Table: 3 Correlation of BMI and with left and right foot-line score

Correlation	r value	p-value
BMI and with right footline score	−0.09818	0.4555
BMI and with left footline score	−0.1270	<0.0001

On the calculation of correlation between BMI and Right foot line score using Pearson correlation coefficient, there was were a negative correlation(r= - 0.09818, p 0.4555) and also shows there is were a negative correlation be-

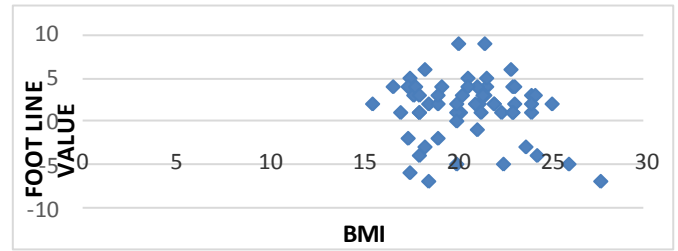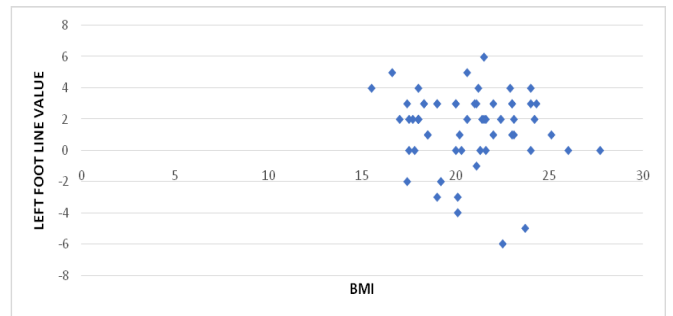tween the left foot line score and BMI(r= -0.1270, <0.001)

Figure: 8 Right footline score

The graph shows the correlation between BMI and Right foot line test value which was a negative correlation (r= -0.09818)

Fig 9: Left foot line score graph

Shows a negative correlation between the BMI and left foot line test values

DISCUSSION

This study can be conducted on different population whit different sample size here study was conducted on 60 youngsters who were physiotherapy students. The purpose of the study was to calculate the normative values of the foot line test in physiotherapy students. The study was conducted to find out the normative value of FLT in the physiotherapy population .and also the correlation of FLT with BMI.

The study demonstrated that the FLT is a reproducible measure of the position of the medial prominence of the navicular in the medio-lateral direction.

The results of this study showed the normative foot line value is ranging from -5 to 8 for the male right foot and for a female is 0 to 5 similarly for the left foot for a male is -3 to 5 and female is for 0 to 4.[4]

The results of our study have shown some similarities in the study done by Christoffer Brushon, the "Reliability and Normative Values of the Foot Line Test." It was conducted on 130 subjects with mean foot size 44 (41-50 European size with test-retest study design. This study concluded that the FLT values ranged from –8 to 14 mm. The mean for tester 1 was 3.3 to3.4 mm, and the mean for tester 2 was 3.9 to 3.2 mm FLT. The study result is differing from our study as it was conducted on European males.[4.]

The difference in the value could be because of the structure of the foot in Indian and European population is different.

Measures of the position of the tuberosity of the navicular in the Mediolateral direction possess reproducibility that seems to be appropriate for many clinical purposes The FLT requires little instrumentation and can be performed in approximately 1 minute and is shows reliability.[9]

There was a negative correlation between BMI and Foot line values and also shows there is no correlation between the left foot line score and BMI. Our result also similar to study done by Mohsen pourghasem and nematollah kamali in the study they calculate the prevalence of flat foot among school student and its relationship with BMI they got the positive correlation between the flat foot and increased BMI.[7]

CONCLUSION

The study result shows that the normative value of males which is found to be ranging from -5 to 8 and for females ranging from 0 to 5. For left foot normative values for males is ranging from -3 to 4, and for females, its 0 to 4. Correlation of foot length and person height is positively correlated, and correlation of BMI is positively correlated with the right foot, negatively correlate with the left foot

Conflict of Interest : None reported

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