

The Effect of Shoe Sizing System on South Indian Ladies

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Abstract— One of the obvious distinctions within comfortable and uncomfortable shoes is based on the fit preferences in the different regions of ladies' shoes. Fourth-three young women in the age interval of 16-21 participated in the study. Each participant is asked the experience they have been experiencing as young women regarding the comfort of footwear in written form. And also, each of them went under a three-dimensional foot scanning process to make an accurate guess of discomfort. This paper grants an effective overview of the effect of shoe fitting on the customer during the long-term usage of the product.

Keywords— Fitting; sizing system; foot pain; footscanner

I. INTRODUCTION

A footwear size is an implication of the fitting measurement of a shoe. On long term usage of footwear which does not fit properly can be harsh toward the healthiness of our feet and even for full body. Predicaments by our foot can bring severe health conditions such as swelling, soreness, inflammation, diabetes, nerve, and blood circulation dysfunctions.

Footwear can be defined as an outer covering for the foot, usually of leather with a stiff or thick sole and heel, and generally (distinguishing it from a boot) reaching no higher than the ankle.

There are numerous different shoe-size methods adopted globally. The most common is the customary which for men's shoes is one size shorter than the UK equivalent, making a men's 13 in the US the same size as a men's 12 in the UK. In the Continental European system, the shoe size is the length of the last, expressed in Paris points, for both sexes and for adults and children alike. The Mondopoint shoe length system is widely used in the sports industry to size athletic shoes, ski/skate boots, and pointe ballet shoes; it was also adopted as the primary shoe sizing system in USSR, Russia, GDR, China, Japan/Taiwan/South Korea and as an optional system in the United Kingdom, India, Mexico, and European countries. NATO and other military services also use the Mondopoint system.

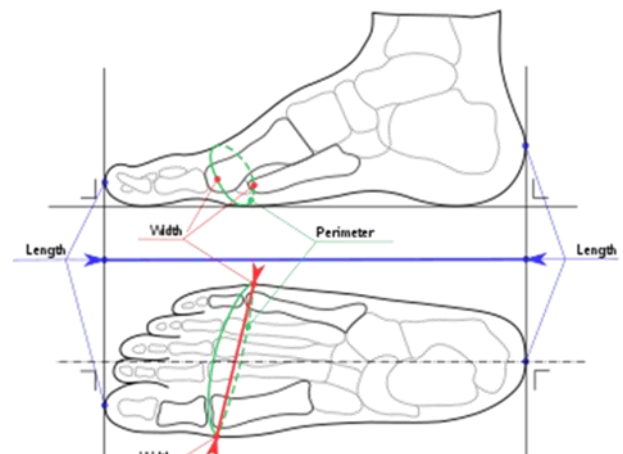


Figure 1. Measurement of foot length, width and perimeter (circumference) as defined in the Mondopoint standard

Next to fashion, shoe fitness is an important selection criterion. To acquire consumer foot information, the shoemaker should have a foot size information system. Such a system should collect consumer foot data for further analysis such as shoe last design and population distribution as well as for communication with customers. When the foot-shoe "tightness" exceeds a certain threshold, discomfort, or pain results.



Figure 2. Shoe areas analyzed during personal fit preference tests

Humans have used footwear for approximately 30,000 years. Although originally worn as a protective covering for the foot, modern footwear is designed to fulfill a range of purposes, the accomplishment of which is judged by three criteria: form, function, and fit. Fit pertains to how footwear

can accommodate the morphology of the foot. Footwear fitting is acknowledged as being vitally important as in most cases fit governs function. This means that footwear cannot fulfill its intended purpose if it does not fit the foot correctly. Furthermore, it has been suggested that incorrectly fitted footwear is a major contributor to the development of structural foot disorders, such as hallux valgus and lesser toe deformity as well as skin lesions, such as corns and calluses.

II. APPROACH

A. Sample determination

Sample size determination is the act of determining the number of observations or replicates to include in an analytical representation. Sample size is a group of subjects that are chosen from the overall population and is viewed as a representative of the actual population for that specific study. In application, the sample size used in research is habitually decided depend on the cost, time, or suitability of gathering the data, and the demand concerning it to contribute satisfactory statistical stamina.

More massive sample sizes decrease sampling error just at a decreasing scale. Numerous statistical formulas are available for determining sample size. There are numerous approaches, incorporating many different formulas, for calculating the sample size for certain data.

$$n = \frac{p(100 - p)z^2}{E^2}$$

n- is the required sample size

P- is the percentage occurrence of a state or condition

E- is the percentage maximum error required

Z- is the value corresponding to level of confidence required

Total population of Tamil Nadu is =36,009,055 (Census of India)

Female in the age interval of 16-21 is 9.7%

$$\text{Confidence}=95\% \quad p=0.5 \quad \text{Error}=0.14$$

$$n=36,009,055 \times 9.7\% = 3,492,878$$

$$\frac{1-95}{2} = 0.025 \quad Z$$

$$\text{Alpha divided by 2: } \frac{1-0.025}{2} = 1.96$$

$$\text{score} = \text{Norms.slnv}(1-0.0025) = 1.96$$

$$\text{Sample size} = \frac{Z^2 \cdot P(1-P)}{1 + \left(\frac{Z^2 \cdot P(1-P)}{e^2 \cdot N} \right)}$$

$$\frac{1.96^2 \cdot 0.5(1-0.5)}{0.155^2} \approx 40$$

$$1 + \left(\frac{1.96^2 \cdot 0.5(1-0.5)}{0.155^2 \cdot 3,492,878} \right)$$

B. Data collection and analysis

While the present fitting system is custom-built based on the European footwear market; the last has a fitting downside, that results in affect locomotion of Tamilian customers. Throughout the project section, the foot of population representatives from Tamil Nadu is scanned using a 3D foot scanning machine. The girth size of the Indian foot is assumed to be wider. due to the weather and customary outfit (Saree) the ladies prefer to wear open footwear. This typical usage of open footwear brings wider ball girth compared to the European fitting system.

Demographically the sample of the population is 16 - 21 years aged female who came from different parts of Tamil Nadu. Data has been collected from 55 subjects in total.



Figure 3 Data collection

Table 1. Fitting percentage

Fitting	Frequency	Percent	Cumulative Percent
E	4	9.1	9.1
F	10	22.7	31.8
G	5	11.4	43.2
H	10	22.7	65.9
SE	2	4.5	70.5
XH	6	13.6	84.1
XXH	7	15.9	100.0
Total	44	100.0	

Table 2. Priority table

	Priority I	Priority II	Priority III	Priority IV	Priority V
Sandal	22	7	7	3	4
Leather	3	6	17	13	5
Court	12	17	7	8	1
Sports	2	8	13	17	4
High heel	5	6	1	3	29

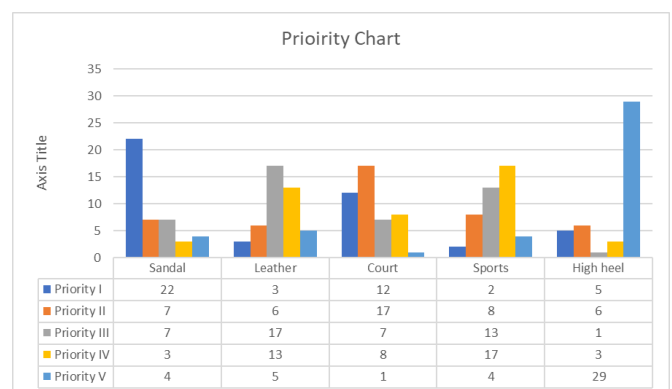


Figure 4. Priority Chart

TABLE 3. OWNED VS PREFERRED

	Preferred percentage	Owed percentage	Deference
Sandal	26	52	-26
Leather	18	12	6
Court	25	21	4
Sports	18	13	5
High heel	13	2	11

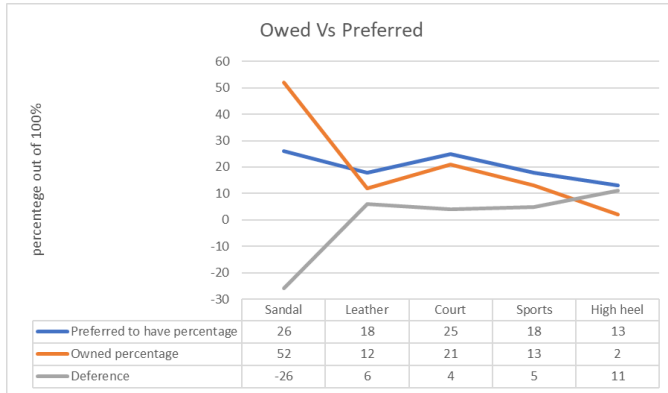


Figure 5. Owed vs Preferred chart

Table 4. Foot pain registered from the subjects

No.	Types of foot pain	No of subjects
1.	Toe region	7
2.	Ankle region	6
3.	Metatarsal region	2
4.	Nail region	1
5.	Sore feet	1

III. CONCLUSION

Existing standard for sizing system (Indian Standard Specification for Sizes and Fitting of Footwear” is ISO standard used by the footwear manufacturer as reference. Based on collected data from the subjects implies deviation. 16 subjects out of 55 total has foot pain which is about 30%. The deviation of fitting on the standard affected the health of footwear customers. Also, 52% of population footwear is

sandal/Chappal. This makes the form of foot difficult for generating standard.

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