

# VARIATIONS OF FOOT MEASUREMENT OF PRIMARY SCHOOL GOING STUDENTS THROUGH BINARY LOGISTIC REGRESSION ANALYSIS- A CASE STUDY IN KHULNA REGION Adhir Chandra Paul, Md. Nafis Sadik and Md.Shahedur Rahman Rony

#### **ABSTRACT:**

The present study was undertaken to establish the association between the left foot and the right foot in terms of length, width, girth height, weight, arch measurement and to define its acuteness, as well as to suggest a binary logistic mathematical model for the analysis and obtain definite conclusion about these variable with the changes

#### **INTRODUCTION:**

- Fitting comfort is perhaps the most critical part of shoe design. It is definitely a major factor in the decision to buy a specific pair of shoes and it is obvious that good fit comfort can alleviate many common abrasion and pressure-related foot problems that often characterize the use of new shoes
- The most critical part of customizing footwear is creating a personalized or better-fitting shoelast
- This paper explains the foot measurement process and variations of foot measurement of primary school going students of age 8 to 12 and also offers descriptions of the similarity between foot length and joint girth, as well as knowledge that the human foot booth is not the same in measurements and similarity between two foot. These measurements also vary in age to weight and height to height.

#### **Objectives:**

- To determine the foot changes of school going students
- Analysis the changes with height and weight to ensure proper weight allocation
- To perform Binary Logistic Regression analysis between foot parameters

Materials and Methods : The following measurements are taken for primary school going students using Foot Calipe, Measuring tape and Weight machine

- Foot length Measurement
- Foot width measurement
- Foot girth measurement
- Height Measurement
- Weight Measurement
- Arch Measurement







**Fig: Collecting various data** 

✓ The collected data were analyzed using Binary Logistic Regression analysis, Microsoft word, Microsoft XL, SPSS

|    |            |         | Reports<br>Descriptive Statistics | ,                |                       | <b>M</b> 4     |         |                         | 0                                   |         |
|----|------------|---------|-----------------------------------|------------------|-----------------------|----------------|---------|-------------------------|-------------------------------------|---------|
|    | Name       | Туре    | Bayesian Statistics               | •                | Values                | Missing        | Columns | Align                   | Measure                             | Role    |
| 1  | age        | Numeric | Ta <u>b</u> les                   | •                | 0, 8-9}               | None           | 12      | 疆 Right                 | 🚓 Nominal                           | > Input |
| 2  | leftInth   | Numeric | Compare Means                     |                  | 1.0, lowest}          | None           | 12      | Right Right             | ht 🔗 Scale<br>ht 🔗 Scale            | Input   |
| 3  | rightInth  | Numeric | General Linear Model              |                  | 1.0, lowest}          | None           | 12      | 게 Right                 |                                     |         |
| 4  | leftwidth  | Numeric | Generalized Linear Models         |                  | 1.0, lowest}          | None           | 12      | 🗃 Right                 | 🔗 Scale                             | > Input |
| 5  | rigtwidth  | Numeric | Mixed Models                      |                  | 1.0, lowest}          | None           | 12      | Right                   | Scale Scale                         | > Input |
| 6  | leftgirth  | Numeric | Milled Models                     |                  | 1.0, low}             | None           | 12      | Right                   | Scale 8                             | > Input |
| 7  | rightgirth | Numeric | Correlate                         |                  | 1.0 low               | Mono           | 12      | Right                   | Scale 8                             | > Input |
| 8  | height     | Numeric | Regression                        | ,                | Automatic             | Linear Modelin | 9       | Right                   | Scale 8                             | > Input |
| 9  | weight     | Numeric | Loglinear                         | ,                | Linear                |                |         | Right 📲 Right           | Scale 8                             | 🔪 Input |
| 10 | arclenleft | Numeric | Neural Networks                   | 5<br>5<br>5<br>5 | Curve Esti            | mation         |         |                         | Scale 🔗                             | S Input |
| 11 | arclenrit  | Numeric | Classify                          |                  | Partial Least Squares |                |         | Right<br>Right<br>Right | Scale     Scale     Scale     Scale | Input   |
| 12 | archytlft  | Numeric | Dimension Reduction               |                  |                       |                |         |                         |                                     |         |
| 13 | archytryt  | Numeric | Scale                             |                  |                       |                |         |                         |                                     | > Input |
| 14 |            |         | Nonparametric Tests               | •                | Multinomi             | al Logistic    |         |                         |                                     |         |
| 15 |            |         | Forecasting                       | •                | Orginal               |                |         |                         |                                     |         |
| 16 |            |         | Survival                          |                  | Probit                |                |         |                         |                                     |         |
| 17 |            |         | Multiple Response                 |                  | Nonlinear             |                |         |                         |                                     |         |
| 18 |            |         | Missing Value Analysis            |                  | Weight Es             | timation       |         |                         |                                     |         |
| 19 |            |         | Multiple Imputation               |                  | 2-Stage L             | east Squares   |         |                         |                                     |         |
| 20 |            |         | Complex Samples                   | ,                |                       |                |         |                         |                                     |         |
| 21 |            |         | B Simulation                      |                  | Optimal S             | caling (CATREC | »J      |                         |                                     |         |
| 22 |            |         | Ouelly Orehel                     |                  |                       |                |         |                         |                                     |         |
| 23 |            |         | Quality Control                   | 1                |                       |                |         |                         |                                     |         |
| 24 |            |         | ROC Curye                         |                  |                       |                |         |                         |                                     |         |

|                                                         | atistics viewer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                    |        | U X |  |  |  |  |  |  |  |
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| Output .                                                | Logistic Regression                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                    |        |     |  |  |  |  |  |  |  |
| Logistic Regression                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                    |        |     |  |  |  |  |  |  |  |
| + 20 Title                                              | [DataSet1] C:\Users\NSM\Down]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | loads\adr                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | spss.sav                                                           |        |     |  |  |  |  |  |  |  |
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| Case Processing                                         | Case Processing Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                    |        |     |  |  |  |  |  |  |  |
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| Block 0: Beginning                                      | Selected Cases Included in Analysis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 100.0                                                              |        |     |  |  |  |  |  |  |  |
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| <ul> <li>number of right ler</li> <li>number of left widt</li> <li>number of right wi</li> <li>number of right wi</li> <li>number of left girth</li> <li>number of right girt</li> <li>student height [hei</li> <li>student weight [wei</li> </ul> | number of right len             |
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| <ul> <li>number of right wi</li> <li>number of left girth</li> <li>number of right gir</li> <li>student height [height</li> <li>student weight [weight</li> </ul>                                                                                  | rumper of left width            |
| <ul> <li>number of left girth</li> <li>number of right gir</li> <li>student height [height</li> <li>student weight [weight</li> </ul>                                                                                                              | number of right wid             |
| number of right gir<br>student height [height<br>student weight [weight]                                                                                                                                                                           | number of left girth            |
| student height [hei                                                                                                                                                                                                                                | number of right girt            |
| Student weight [we                                                                                                                                                                                                                                 | student height [height          |
|                                                                                                                                                                                                                                                    | student weight [wei             |
| no. of arch left leng                                                                                                                                                                                                                              | no. of arch left leng           |
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| 🛷 no. of arch right he                                                                                                                                                                                                                             | 🔗 no. of arch right hei         |

### Fig: Analyzing Collecting data

Department of Leather Engineering, Khulna University of Engineering and Technology, Khulna-9203

#### **RESULTS AND DISCUSSION:**

|                                |                            |      |                           |                                |                                   | C |
|--------------------------------|----------------------------|------|---------------------------|--------------------------------|-----------------------------------|---|
|                                |                            | age  | length<br>of left<br>foot | lengh<br>t of<br>right<br>foot | length<br>of left<br>wide<br>foot | C |
| age                            | Pearson<br>Correlatio<br>n | 1    | 014                       | .579                           | .494                              |   |
| length of<br>left foot         | Pearson<br>Correlatio<br>n | 014  | 1                         | .008                           | .040                              |   |
| lenght of<br>right foot        | Pearson<br>Correlatio<br>n | .579 | .008                      | 1                              | .617                              |   |
| length of<br>left wide<br>foot | Pearson<br>Correlatio<br>n | .494 | .040                      | .617                           | 1                                 |   |
|                                |                            |      |                           |                                |                                   |   |
| widee of<br>right foot         | Pearson<br>Correlatio<br>n | .403 | .067                      | .587                           | .825                              |   |
|                                |                            |      |                           |                                |                                   |   |
| grift of left<br>foot          | Pearson<br>Correlatio<br>n | .395 | 056                       | .597                           | .723                              |   |
|                                |                            |      |                           |                                |                                   |   |
| girth of<br>right foot         | Pearson<br>Correlatio<br>n | .394 | .066                      | .440                           | .633                              |   |

Age:

LOWEST



Left Foot width:

### 🔗 number of age [age] leftinth rightinth leftwidth rigtwidth leftgirth Method: Enter Selection Variable: OK Paste Reset Cancel Help

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#### **Conclusion:**

| orrelat                  | ions                     |                           |        |            |                                    |                             |                      |                             |                                |                            |      |                           |                                |                                   | Correlat                  | ions                     |                           |            |            |                                    |                             |                         |                             |
|--------------------------|--------------------------|---------------------------|--------|------------|------------------------------------|-----------------------------|----------------------|-----------------------------|--------------------------------|----------------------------|------|---------------------------|--------------------------------|-----------------------------------|---------------------------|--------------------------|---------------------------|------------|------------|------------------------------------|-----------------------------|-------------------------|-----------------------------|
| videe<br>f right<br>foot | grift of<br>left<br>foot | girth of<br>right<br>foot | height | weig<br>ht | arcle<br>nth<br>of<br>left<br>foot | arclent<br>of right<br>foot | arcy of<br>left foot | arcy<br>of<br>right<br>foot |                                |                            | age  | length<br>of left<br>foot | leng<br>ht of<br>right<br>foot | length<br>of left<br>wide<br>foot | widee<br>of right<br>foot | grift of<br>left<br>foot | girth of<br>right<br>foot | heigh<br>t | weig<br>ht | arcle<br>nth<br>of<br>left<br>foot | arclent<br>of right<br>foot | arcy of<br>left<br>foot | arcy<br>of<br>right<br>foot |
| .403                     | .395                     | .394                      | .219   | .480       | .077                               | .126                        | .761                 | .379                        | age                            | Pearson<br>Correlatio<br>n | 1    | 014                       | .579                           | .494                              | .403                      | .395                     | .394                      | .219       | .480       | .077                               | .126                        | .761                    | .379                        |
| .067                     | 056                      | .066                      | 003    | 201        | .138                               | .130                        | 033                  | .067                        | length of<br>left foot         | Pearson<br>Correlatio<br>n | 014  | 1                         | .008                           | .040                              | .067                      | 056                      | .066                      | 003        | -<br>.201  | .138                               | .130                        | 033                     | -<br>.067                   |
| .587                     | .597                     | .440                      | .246   | .179       | 085                                | 040                         | .394                 | .175                        | lenght of<br>right foot        | Pearson<br>Correlatio<br>n | .579 | .008                      | 1                              | .617                              | .587                      | .597                     | .440                      | .246       | .179       | -<br>.085                          | 040                         | .394                    | .175                        |
| .825                     | .723                     | .633                      | .250   | .159       | 112                                | 041                         | .256                 | .005                        | length of<br>left wide<br>foot | Pearson<br>Correlatio<br>n | .494 | .040                      | .617                           | 1                                 | .825                      | .723                     | .633                      | .250       | .159       | -<br>.112                          | 041                         | .256                    | .005                        |
| 1                        | .693                     | .633                      | .258   | .077       | 184                                | 068                         | .236                 | -<br>.024                   | widee of<br>right foot         | Pearson<br>Correlatio<br>n | .403 | .067                      | .587                           | .825                              | 1                         | .693                     | .633                      | .258       | .077       | -<br>.184                          | 068                         | .236                    | -<br>.024                   |
| .693                     | 1                        | .524                      | .210   | .109       | 176                                | 092                         | .152                 | -<br>.094                   | grift of left<br>foot          | Pearson<br>Correlatio<br>n | .395 | 056                       | .597                           | .723                              | .693                      | 1                        | .524                      | .210       | .109       | -<br>.176                          | 092                         | .152                    | -<br>.094                   |
| .633                     | .524                     | 1                         | .228   | .085       | 170                                | 002                         | .271                 | .034                        | girth of<br>right foot         | Pearson<br>Correlatio<br>n | .394 | .066                      | .440                           | .633                              | .633                      | .524                     | 1                         | .228       | .085       | -<br>.170                          | 002                         | .271                    | .034                        |

## **Fig: Pearson Correlation**



• Three conversational formulas for measuring foot parameters were built side by side in this research work. The length, width, girth, height, weight and arch measurement are taken of the primary school going students. This research indicates the amount of grading needed in such range and also help to create proper fitting in those ranges.

#### Left Foot length:



Arc left foot length :



**Right Foot girth:** 



Arc right foot length:



