

4. Conclusions

The Dorothy foot scanning campaign resulted in a large database of European feet with accurate 3D foot scans. The shoe producers can get valuable information about their customer's feet dimensions. They can use this information when designing lasts.

Although there have been many reports on 3D foot scanning, they comprised rather small samples. Most of the previous measurements were performed on smaller geographical areas, which didn't offer possibilities to compare foot dimensions between multiple European nations.

The main conclusions of the analysis are presented in the following points.

4.1 High foot width dispersion

Analysis of the foot measurements shows high variability of foot width within length classes. Only a few shoe producers have been producing shoes in various widths of the same model and size. Further analysis of foot width, which is not presented in details in this paper shows, that one width per size can fit well maximum 50% of the population if the shoe is designed for the average foot width. If the shoe is produced in one width only and is not designed for the average width, it can fit well a very small percentage of the population. Three widths per size have to be used to fit well 95% of the population.

4.2 High foot height dispersion

Even more surprising than foot width variability is foot height variability. Foot height standard deviations are very similar to foot width deviations in all length classes. Considering the fact that average foot width is higher than average foot height, dispersion of foot height is even larger than dispersion of foot width. This means that shoes have to be designed to fit very different feet regarding the feet height. Shoe producers have been aware of this fact in the past. They have been producing shoes with laces of elastic bands which have the possibility to adapt to different heights of feet. They were probably not aware of such a high dispersion of foot height.

4.3 Low foot width-height and foot length-height correlations

Another interesting finding about the foot height is a low correlation between foot width and foot height. This means that a wide foot is not necessarily also a high foot, or the opposite, a narrow foot is not necessarily also a low foot. This fact has to be considered when designing multi width lasts. So far multi width lasts have been scaled by the same factor in width and height, which doesn't make sense according to the results of this study.

A very low correlation between foot length and foot height is also noticeable in this analysis.

All the findings regarding the foot height show that foot height should be seriously considered when designing shoe lasts.

Additional analyses, which are not presented in this paper, have been performed and have resulted in additional conclusions, but cannot be presented due to commercial interests of involved companies.

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