

Shoes from serial production in different width sizes - an urgent need or caprice?

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**Background and aims.** Ill-fitting footwear is an important risk factor for diabetic foot ulceration. A significant difference between the right and the left foot, both in length and in width, can be demonstrated in at least 25% of the general population. The shoe-size systems most often indicate just the length of the foot, since many shoemakers only provide standard width shoes for economical reasons. Foot size and shape can be easily determined by 3D foot measuring technology. The use of 3D foot scanner in the retail shops and in the foot clinics can provide data to enable development of a set of different shoe types in different width sizes. In this pilot project we aimed to explore the size and shape of the feet in the patients with diabetes attending our foot clinic.

**Patients and methods.** 3D foot scanning was performed simultaneously with routine foot screening examination in 154 out-patients with diabetes mellitus. We used the foot scanner based on laser triangulation principle and circular scanning around both feet. 3D shape of left and right foot is simultaneously measured within 10 seconds. The following foot dimensions were analyzed by the scanner's software: length (L), width (W) and perimeter (P) (at the level of MTP joints), normalized width ( $W_{norm}$ ) and perimeter ( $P_{norm}$ ) (adjusted to foot length). **Results.** The length and the width of the left and right foot were different in 151 patients (98.0%). The average absolute differences in L, W and P were 3.26, 1.95 and 3.94 mm, respectively. The following values (in mm) were obtained: L  $252.37 \pm 15.67$  (199.5-286.5), W  $95.99 \pm 6.55$  (78.6-113.9),  $W_{norm}$   $99.31 \pm 4.77$  (84.1-111.9), P  $237.63 \pm 16.39$  (192.6-281.9) and  $P_{norm}$   $245.85 \pm 12.05$  (208.2-277.1). **Conclusions.** The study confirmed a slight difference (less than 1 length-size unit) between the size of the left and right foot in the majority of the observed population. As each shoe size is suitable for a small interval of foot lengths and the inner cavity of a shoe must typically be 15-20 mm longer than the foot, we conclude that the majority of the observed population would not need shoes of different length size. Given the wide variation of the foot width however we assume that shoes of different width sizes should be available.