INTRODUCTION
With regard to 2-point touch sensitivity thresholds (2PT) of the human body Weber et al. (1835) showed that fingertip, tongue and lips are the most sensitive regions, whereas the back is the most insensitive area. The 2PT is the minimal distance at which two simultaneously given stimuli at a specific anatomical location can be discriminated. Clinically, 2PT of the hand or foot are used to assess sensory nerve functions of patients (Barber et al. 2001). Stevens et al. (1996) reported declining discrimination capability with age at different body regions. Only little information could be found in the literature about the 2PT of healthy feet; hallux (2PT = 4-22 mm) and plantar midfoot (2PT = 10-35 mm) according to age were studied (Stevens et al. 1996). There are two main approaches to test 2PT: Conventionally, subjects judge whether one or two stimuli are applied (Stevens et al. 1992). Another method is the two-point gap threshold test, in which subjects decide between a configuration with gap and one without (Stevens et al. 2003). 2PT of different foot regions are important factors with regard to the fit perception of footwear. The purpose of this study was to determine 2PT at different foot regions and to compare those of healthy women and men.

METHODS AND PROCEDURES
20 women (age: 23.1±2.4 years; height: 169.0±6.4 cm; weight: 62.5±9.7 kg) and 20 men (age: 22.5 ±2.7; height: 184.8±7.3; weight: 79.8±8.6 kg) took part in the study. The 2PT of the dominant foot were tested at 8 different anatomical locations:

- Plantar: Calcaneus (PC), Caput Os Met I (PCMI), Hallux (PH)
- Dorsal: Basis Os Met III (DBMIII), Caput Os Met I (DCMI) and V (DCMV)
- Medial: Caput Os Met I (MCMI),
- Lateral: Basis Os Met V (LBVM)

Testing was performed in randomized order. Subjects were lying in supine position. Room temperature was maintained constant at 23.6 (±0.95) °C. Skin temperature of the tested foot was kept constant at 27.6 (±1.6) °C by use of an infra-red lamp. The measurement device was a modified digital vernier calliper (Technologiezentrum W-tec, Wuppertal, Germany) equipped with a customized force transducer. The absolute accuracy of the system is 0.02mm. Stimuli were given at a controlled force of 15-25 grams. The conventional 2PT testing method was used by applying a modified version of Dyck’s 4-2-1 algorithm for measurements with Semmes Weinstein Monofilaments. The initial 2PT distance was set to be 11 mm. Step size was 0.5 mm and stimuli were applied for 1 sec. Each distance was tested five times, twice as one point stimulus and three times as two point stimulus. Four of five correct recognitions were necessary to proceed to the next distance level.

Mean values for each anatomical location and mean values of both gender groups were calculated. Anatomical locations were compared using a repeated measure ANOVA, gender differences were examined using unpaired T-Tests.

RESULTS
The repeated measures ANOVA reveals
statistically significant differences between anatomical locations (p<0.01). PH shows the lowest 2PT whereas DCMI and DBMIII show the highest 2PT (Figure 1).

**DISCUSSION**

2PT at the human foot differ due to foot region and specific anatomical locations. Women are more sensitive compared to men with regard to 2PT. These gender differences are also present with regard to single touch sensitivity (Hennig et al. 2004). In contrast to this, Stevens et al. (1996) found no significant differences for 13 body regions between genders by using the two-point gap threshold test. This indicates the necessity to investigate the influence of different testing methods on the findings of 2PT tests.

**SUMMARY**

The human foot shows different 2PT due to different anatomical locations. Women have lower 2PT at the foot compared to men. Considerable differences were found for the anatomical locations dorsal Met I and V and lateral Met V. These findings may have consequences for the perception of footwear fit.

**REFERENCES**


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