

Determining foot types in healthy and diabetic feet

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1. Introduction

In clinical practice different methods and protocols are used for analyzing feet. The application of the methods depends on the experience of the clinician and mainly static measurement techniques such as podoscopy or blueprint are used. In this study we want to combine existing and recently developed innovative measurement techniques to deploy a more objective foot analysis.

2. Material and methods

In this study we measured 77 healthy subjects (40 male and 37 female) between 19 and 61 years of age (average of 33 years). All subjects were clinically investigated by 9 clinical experts, i.e. 3 podiatrists, 5 certified prosthetist/orthotists (CPO) and 1 foot surgeon. All experts used the techniques they normally use in clinical practice. The results of their analyses were filled in on a form (i.e. 9 per subject) to determine the clinical foot features. Furthermore, we measured the subjects' gait pattern using a plantar pressure plate, force plate, 3D motion analysis system and a 3D dynamic surface scanner, to extract quantitative features during stance and gait. In a second measurement campaign we used the same gait analysis protocol for measuring 25 diabetic patients.

3. Results & conclusion

The collected data is processed in three different ways.

Firstly, we investigate the inter-rater reliability for all the clinical features, and differences between the expert groups. This way we want to get insight in the robustness of each clinical feature.

Secondly, we predict the clinical features making use of the quantitative features from the measurement systems. This way we determine if the clinical features can be represented using quantitative features and which measurement systems are needed to do so, perhaps in a certain combination.

Thirdly, we want to cluster all measured feet into foot types. We do this both on foot typology found in literature and based on the quantitative features to get objective foot types. Furthermore we want to link these objective foot types to the common clinical types.

In a next investigation we want to determine if the diabetic patients typically have different foot types compared to healthy subjects. This information can aid in improving specified footwear.