VALIDITY OF THE INFOOT 3D FOOT DIGITIZER FOR A HEALTHY POPULATION

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INTRODUCTION

In different pathologies where foot problems and deformation play an important role such as rheumatoid diseases, diabetes and neurological conditions, a three dimensional (3D) image of the foot could be used to picture and measure the feet. Since foot digitizers are an easy to use, quick and non-invasive method to get a 3D image, they might be used to monitor changes in the feet over time or to evaluate the effect of therapy both in research and in clinical settings but therefore a high accuracy and a high reliability are indispensable.

To our knowledge the Infoot 3D foot digitizer (I-Ware Laboratory Co., Ltd, Osaka, Japan) has not been validated yet, even though a good validity is prerequisite to be used in a clinical setting. Validity is defined as whether a test measures what it is supposed to measure[1]. It is the measure of the ability of an outcome score to represent the phenomenon under study.

The purpose of this study is to compare the data obtained through the Infoot 3D foot digitizer (I-Ware Laboratory Co., Ltd, Osaka, Japan) with the data from X-rays and clinical measurements.

METHODS

Ten healthy volunteers (5♂ and 5♀, 27-66yr), without complaints or injuries on the lower limbs and without a history of surgery to the feet, participated in the study. A velvet marker, visible in the digitizer, was placed on top of a metal marker, visible on X-ray, on landmarks according to the Infoot manufacturer's instructions.

Data were bilaterally collected with the digitizer. Antero-posterior and sagittal loaded X-rays were taken and linear measurements were performed on a 100% outprint. Clinical parameters were obtained using a sliding calliper and a ruler (Seca GmbH & co. kg., Hamburg, D). Three datasets were collected for each measurement method and then averaged for further statistical analysis.

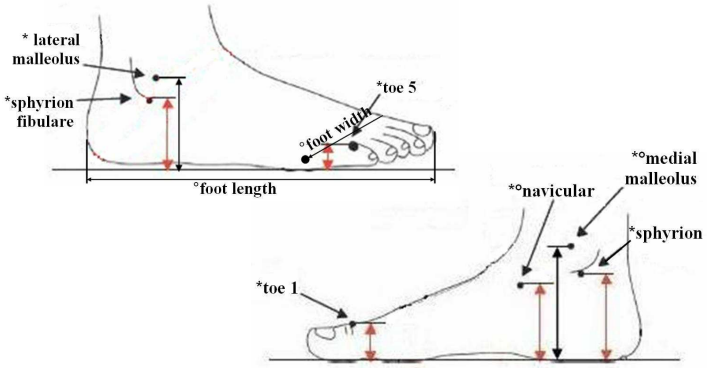

Fig.1: parameters obtained through the different measurement methods
* Infoot versus X-ray data -° Infoot versus clinical data

To assess the validity of the Infoot 3D foot digitizer, Pearson correlation coefficients were calculated between the digitizer's data and both the clinical measurements and the X-ray data. A Pearson correlation coefficient can be considered to be a validity coefficient because it is being used to measure the relationship between a score and an independent criterion test[2]. For all tests the level of significance was set at $\alpha = 0.05$.

RESULTS AND DISCUSSION

Preliminary results show Pearson correlation coefficients between the foot digitizer data and the X-ray data varying between 0.715 and 0.982 (all $p<0.05$) (except for left navicular height $r=0.611$ and $\alpha=0.11$). Between the foot digitizer data and the clinical data the Pearson coefficients vary between 0.726 and 0.982 (all $p<0.05$).

Even though a large interest in the treatment of the lower extremity has yielded a host of proposed measurements to quantify the foot, little attention has been given to robust inquiry into the reliability and validity of these techniques[3]. Radiographic investigation of foot disorders is quite common and angular and linear measurements are regularly performed to quantify the nature of a deformity and therefore considered to be a "golden standard" method.

So far there is no real "golden standard" for clinical measurements of the foot. Therefore, foot length, foot breadth, navicular and medial malleolar height were chosen for the validity study because they represent linear measurements in different dimensions.

All measured variables show a good validity with Pearson correlation coefficients > 0.7 (except for left navicular height when compared to X-ray data). In this study only healthy subjects participated without any serious foot deformities. Caution should be taken when extrapolating the results to different patient populations specifically those with pronounced foot deformities. Further investigations are needed within different patient populations.

CONCLUSIONS

Within this healthy population good validity could be demonstrated comparing the linear measurements from the Infoot 3D foot digitizer (I-Ware Laboratory Co., Ltd, Osaka, Japan) with the data from X-rays and clinical measurements. Therefore, the digitizer offers a quick and non-invasive method to obtain anthropometric data of the foot.

REFERENCES

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