

The Reliability of Using the Artec Eva Hand Held 3 Dimensional Scanner on Children's Feet

Matyas VARGA¹, Stewart C. MORRISON¹, Juliet MCCLYMONT¹, Carina PRICE²

¹ School of Health Sciences, University of Brighton, Eastbourne, UK;

² School of Health and Society, University of Salford, Salford, UK

Abstract

The development of locomotor behaviour in infants and children is accompanied by the progressive development of foot shape and structure. Understanding this process requires 3-dimensional (3-D) scanning technology [1]-[4]. Providing robust data on the development of the paediatric foot shape will help clinicians understand the typical trajectory of the foot and foot shape which could help inform understanding of how paediatric foot pathologies develop.

The collection of this data requires the development of a normative data set and will involve scanning a high number of feet, across a range of ages. Hand-held 3-D scanners provide the portability required to achieve this as they allow researchers to collect data in the children's natural environment. However, there are methodological challenges to consider (e.g. static weight bearing position).

To determine the reliability of our scanning method and analysis, 15 children were recruited, five from each age group (two, five and seven years old). Children stood in a comfortable bipedal stance, barefoot on a Perspex platform of 550mm height. Their feet were scanned three times, including the plantar surface through the platform.

To assess reliability using the intra-rater variability, the within subject standard deviation of the linear measurements and 3D coordinates of corresponding vertices, represented by the TEMs (Technical Error of Measurement) was calculated. The differences in linear measures and in 3-D foot shape between age groups was also quantified to assess if our method is sensitive enough to identify differences between age groups in this small sample.

Acknowledgement

MV is funded via a studentship as part of the Great Foundations initiative funded by the William Scholl Foundation: www.greatfoundations.org.uk

References

- [1] Mauch M, Grau S, Krauss I, Maiwald C, Horstmann T, "Foot morphology of normal, underweight and overweight children.", in *International Journal of Obesity*, 32(7):1068-75, 2008
- [2] Mickle KJ, Steele JR, Munro BJ, "Is the Foot Structure of Preschool Children Moderated by Gender?", in *Journal of Pediatric Orthopaedics*, 28(5):593-6, 2008
- [3] Muller S, Carlsohn A, Muller J, Baur H, Mayer F, "Static and dynamic foot characteristics in children aged 1-13 years: A cross-sectional study.", in *Gait & Posture*, 35(3):389-94, 2012
- [4] Chang HW, Lin CJ, Kuo LC, Tsai MJ, Chieh HF, Su FC, "Three-dimensional measurement of foot arch in preschool children.", in *Biomedical Engineering Online*, 11, 2012