



Body Proportions Estimated by Photometry

Willem JM Gerver¹, Ralph Brecheisen², Bas Penders¹, Saartje Straetemans¹

¹Department of Paediatric Endocrinology Maastricht University Medical Center + (MUMC+), ²Maastricht Brain Imaging Center (M-BIC)

Introduction

The measurement of height and weight are part of daily paediatric practice. More elaborate measurements are performed in the field of endocrinology to monitor growth and in the field of genetics to detect syndromes. Such measurements are essential to properly monitor the proportional growth of a child. However, to correctly perform such measurements manually is a time-consuming procedure which requires specific tools and skills. Therefore, we developed an alternative measurement method using photogrammetric anthropometry, also referred to as photometry. Photometry involves the measurement of body dimensions in digital images of subjects using specialised software. The main advantage of this measurement method is that it **reduces the time** needed to perform measurements. It also provides **more flexibility** for the paediatrician since taking the digital image and performing the analysis are separated.

Methods

Measurement

Measurements were taken of 24 outpatients between 5 and 18 years old visiting the Maastricht University Medical Centre (MUMC+). The manual measurements were taken by two trained measurers, using standardised techniques [1]. These measurements included: height, sitting-height, arm span, biacromial width, biliacal width, upper arm length, lower arm length, hand length and foot length.

Of all patients frontal and lateral pictures were taken. The patients were carefully instructed as to stand according to the standard anatomical position. The patient were photographed standing on a square mat as a reference object of known size lying on the floor.

Photometry software

Anatomical reference points are selected in the images. The photometry software then calculates the distance between the selected points (fig.1). The use of a reference object is necessary to calculate the correspondence between pixels in the image and length in centimetres of the measurements (fig. 2). The measurements are compared to the reference values presented in *Paediatric Morphometrics* [1].

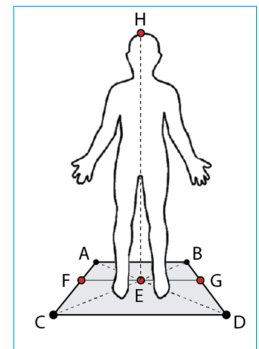


Figure 2: The use of a reference object



Figure 1: Measurement section of the photometry software

Results

Comparing manual measurements

Distance	Average difference cm (n=24)
Biacromium	0,6
Biliacum	0,6
Upper arm	0,8
Lower arm	0,4
Hand	0,3
Foot	0,5

Table 1: comparison of manual measurements

Comparing photometry to manual measurement

Distance	Average difference cm (n=24)	Average difference % (n=24)
Height	1,8	1,3
Biacromium	1,2	4,1
Biliacum	2,4	11,0
Upper arm	2,2	9,7
Lower arm	1,8	9,4
Hand	1,0	6,6
Foot	0,8	3,8

Table 2: comparison of photometry to manual measurements

Conclusion

Photometry reduces the time needed to perform advanced measurements of the human body and provides more flexibility to the user. A first version of the photometry software is finished and initial results are promising. Further research will focus on the following improvements:

- Correction of optical and perspective distortion in the digital images
- Optimizing positioning of the subject
- Optimizing shape and position of a reference object.

Correspondence

Willem-Jan Gerver: w.gerver@maastrichtuniversity.nl

References

1. Gerver W, de Bruin R: *Paediatric morphometrics: A reference manual*, 3rd ed. Maastricht, University Press Maastricht, 2011.

Acknowledgements

Arcus Solutions, Angèle Gerver, Ferring Pharmaceuticals