

ISAK and digital 3D body measurement: A longitudinal case study from elite cycling

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Title: ISAK & DIGITAL 3D BODY MEASUREMENT: A LONGITUDINAL CASE STUDY FROM ELITE CYCLING.

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Introduction: Digital 3D body measurement, also known as 3D body scanning, captures 3D images of the external geometry of the body. An array of anthropometrics can be extracted from these digital images. To date no kinanthropometry study has investigated the longitudinal use of this method. The aim of this study was to investigate the use of digital 3D body measurement in the longitudinal kinanthropometric assessment of an elite mountain bike cyclist.

Method: This investigation was an observational, longitudinal case study of one elite female mountain bike cyclist (age 25 years; stature 179cm; body mass 70.8 kg). Anthropometrics of the whole body were acquired on 20 occasions over a period of 6 months, with a mean of 1.2 weeks between sessions. During each collection 27 anthropometric locations were manually palpated and marked, following the International Society for the Advancement of Kinanthropometry (ISAK) guidelines. A high precision commercially available surface imaging system, 3dMD (3dMD Inc., Atlanta, GA, USA), captured 3D images of the participant's body in seven positions. Using bespoke software (KinAnthroScan) developed in-house, the 3D images were manually digitised and the girth at 2mm intervals along the long axis of each body segment was exported.

Results: This method was quick, allowed retrospective or immediate analysis and the ability to produce a digital representation of body changes over time. Furthermore, measuring and assessing the entire length of a segment provided greater detail regarding anthropometric change, that otherwise would have been overlooked. For example left thigh girth (measured at the recommended ISAK position) demonstrated only a 0.5% change, yet the upper leg experienced a mean change in girth of $2.36\% \pm 1.35\%$.

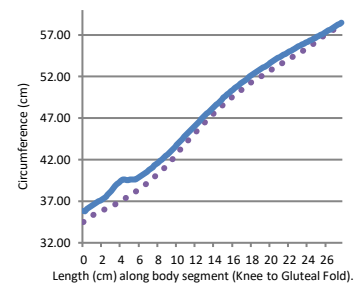


Figure 1: Left thigh girth at the first (—) and last data collection (· · ·).

Conclusions: Digital 3D body measurement appears to be a suitable method for longitudinal anthropometric assessment of athletes. The greater detail provided by this method enables the detection of adaptations that are not apparent using traditional anthropometrics. Standardised guidelines for digital 3D body measurement are required to ensure consistent and repeatable use in both kinanthropometry practice and research.

Keywords: Scanning, Kinanthropometry, Surface Imaging, 3D anthropometry.