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Photonic scanning for anthropometry

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Anthropometric data are usually collected manually by using calipers and measuring tapes, giving information on the static dimensions of the body in a standard position. These measurements are straightforward, but the amount of yielded information is limited to actual measurements; moreover, the results vary according to the observer's skill level and measurement protocol, and procedures may be time-consuming. Recently, a number of three-dimensional (3D) anthropometric studies have been performed using fast and contact free measurements by using 3D whole-body scanners the main advantages being: soft tissues are not compressed during data acquisition, row data acquisition is rapid (seconds), repeatability of measurements on the same subjects over time is unlimited. In this work we evaluated the reliability of a new 3D whole-body scanner, the Breuckmann BodyScan, in anthropometric measurement.

Six men and six women were enrolled in this study after informed consent; the physical characteristics of the study group were: mean age 22,7±2,16 years; mean stature 168,2±7,38 cm; mean body mass 61,5±6,16 kg. During scanning and manual anthropometry, subjects wore close-fitting underwear. A set of 22 anthropometric measures was chosen to include most of the current circumferences, lengths, and widths taken in anthropometric surveys. Manual anthropometry was performed in duplicate by an experienced anthropometrist according to standard procedures after marking landmarks with a dermographic pen. Measurements were conducted on 3D images of subjects using the same landmarks as manual anthropometry and dedicated software based on a VTK library. Digital measurements were independently performed by the experienced anthropometrist and two naive anthropometrists on two different occasions (Ts1 and Ts2). Data were analyzed using the Pearson's r, the intraclass correlation coefficient (ICC), and the student's t test. Percent coefficient of variation (%CV), technical error of measurement (TEM), and standard error of measurement (SEM) were calculated as well.

Results show excellent agreement of intraobserver duplicate measurements in both the manual and digital mode as well as non significant systematic error. Similar finding were found when digital measurements taken by the expert and the two naïve anthropometrists were compared.

Digital anthropometry is a reliable method to investigate the body dimensions without requiring extensive training and experience.

Keywords: anthropometry, scanning, 3D