

Novel Anthropometry Based on 3D-Bodyscans Applied to a Large Population Based Cohort

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Abstract

Three-dimensional (3D) whole body scanners are increasingly used as precise measuring tools for the rapid quantification of anthropometric measures in epidemiological studies. We analyzed 3D whole body scanning data of nearly 10,000 participants of a cohort collected from the adult population of Leipzig, one of the largest cities in Eastern Germany. We present a novel approach for the systematic analysis of this data which aims at identifying distinguishable clusters of body shapes called body types. In the first step, our method aggregates body measures provided by the scanner into meta-measures, each representing one relevant dimension of the body shape. In a next step, we stratified the cohort into body types and assessed their stability and dependence on the size of the underlying cohort. Using self-organizing maps (SOM) we identified thirteen robust meta-measures and fifteen body types comprising between 1 and 18 percent of the total cohort size. Thirteen of them are virtually gender specific (six for women and seven for men) and thus reflect most abundant body shapes of women and men. Two body types include both women and men, and describe androgynous body shapes that lack typical gender specific features. The body types disentangle a large variability of body shapes enabling distinctions which go beyond the traditional indices such as body mass index, the waist-to-height ratio, the waist-to-hip ratio and the mortality-hazard ABSI-index. In a next step, we will link the identified body types with disease predispositions to study how size and shape of the human body impact health and disease.