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Precision and Error of Three-Dimensional Phenotypic Measures Acquired From 3dMD Photogrammetric Images

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The genetic basis for complex phenotypes is currently of great interest for both clinical investigators and basic scientists. In order to acquire a thorough understanding of the translation from genotype to phenotype, highly precise measures of phenotypic variation are required. New technologies, such as 3D photogrammetry are being implemented in phenotypic studies due to their ability to collect data rapidly and non-invasively. Before these systems can be broadly implemented, the error associated with data collected from images acquired using these technologies must be assessed. This study investigates the precision, error, and repeatability associated with anthropometric landmark coordinate data collected from 3D digital photogrammetric images acquired with the 3dMDface System. Precision, error due to the imaging system, error due to digitization of the images, and repeatability are assessed in a sample of children and adults (n = 15). Results show that data collected from images with the 3dMDface System are highly repeatable and precise. The average error associated with the placement of landmarks is sub-millimeter; both the error due to digitization and due to the imaging system are very low. The few measures showing a higher degree of error include those crossing the labial fissure, which are influenced by even subtle movement of the mandible. These results suggest that 3D anthropometric data collected using the 3dMDface System are highly reliable and, therefore, useful for evaluation of clinical dysmorphology and surgery, analyses of genotype-phenotype correlations, and inheritance of complex phenotypes. © 2005 Wiley-Liss, Inc.

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