

MULTIMODAL MORPHOLOGICAL DESCRIPTION OF A CENTRAL EUROPEAN POPULATION: THE A.D.A.P.T. SW PLATFORM AND FIDENTIS DATABASE

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Background: The Anthropological Database of Body Proportions (A.D.A.P.T.) project was established as a multimodal morphological database with the primary aim to describe the variability in the Central European population.

Materials and methods: The A.D.A.P.T. SW platform includes adults of both sexes across a broad age and BMI spectrum. Standardized anthropometric measurements are combined with high-resolution 3D body and facial scans, whole-body MRI data and demographic metadata. These allow analyses of body shape variability, proportionality, adiposity distribution and sex- and age-related differences. It is complemented by the FIDENTIS that represents a large-scale 3D facial database designed for the analysis of facial morphological variability in a Central European population (adults and sub-adults). Facial data are acquired using stereophotogrammetric systems.

A key methodological contribution of A.D.A.P.T. and FIDENTIS analytical approaches is utilized and demonstrated within a unified 3D analytical framework where longitudinal pre- and post-operative bariatric datasets from the Kardiovize project at Saint Anne University Hospital are analysed using surface analysis based on geometric morphometrics of dense 3D surfaces, enabling quantification of regional facial soft-tissue changes following major weight loss.

Results: Clinical applications submitted for funding include craniofacial and neck morphology in obstructive sleep apnea, and machine-learning-based prediction of insulin resistance from body composition and surface morphology. Longitudinal bariatric cohorts enable detailed assessment of coordinated facial-body morphological transformation following major weight loss, with quantification of regional soft-tissue redistribution and shape change. In ergonomics, the A.D.A.P.T. platform is used for clothing and protective equipment design, optimization of sizing systems and evaluation of body-shape compatibility in occupational and extreme-environment settings. In parallel, the FIDENTIS database is increasingly applied in ergonomic contexts focused on wearables and facially interface-dependent protective equipment.

Conclusions: Future development targets advanced clinical risk modelling, multimodal body composition analysis and predictive modelling of morphological change. The platforms support international collaboration in comparative anthropology, geometric morphometrics, biomedical anthropology and ergonomics, particularly in cross-population variability research and personalized morphological prediction systems.

Keywords: 3D human body modelling; Body surface and composition analysis.