H62 Sex and Ancestry Estimation From Landmarks of the Cranial Base

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The goal of this presentation is to study the nature of morphological variation in the base of the human cranium and the utility of that variation for estimating sex and ancestry from skeletonized remains. Discriminant functions that accurately estimate sex and ancestry for American Whites and Blacks from the cranial base are presented.

This presentation will impact the forensic science community by providing new tools for estimating sex and ancestry from skeletonized human remains, particularly in the case of fragmentary crania where portions of the cranial base remain intact. Sex and ancestry are important components of the biological profile that physical anthropologists seek to establish for unidentified individuals. Methods that are appropriate for use with fragmentary remains expand the range of tools available to practicing forensic anthropologists.

It is well established that craniofacial morphology can be used to estimate sex and ancestry of human remains, but in some instances crania are not recovered intact. Building on earlier research by Holland (1985, 1986) that indicated dimensions of the cranial base can be used for sex and ancestry attribution, it is hypothesized that sex and ancestry can be more accurately estimated using the three dimensional morphology of the cranial base.

A sample of 277 crania from individuals of known sex and ancestry from the Robert J. Terry (National Museum of Natural History, Smithsonian Institution) and William M. Bass (University of Tennessee, Knoxville) collections is used to test this hypothesis. A series of 12 landmarks from the cranial base were observed as three dimensional coordinates and analyzed using geometric morphometric and traditional statistical methods. The Cartesian coordinates were fitted with general procrustes analysis, which brings the configurations into a common coordinate system, rotates and scales them. The fitted coordinates were then subjected to principal component analysis. Principal components representing ninety percent of the shape variation and the centroid size from the procrustes analysis were used to derive discriminant functions for classifying crania as to sex and ancestry (American Whites and Blacks).

Using landmarks from this morphological region, both sex and ancestry can be classified with greater than eighty five percent accuracy. As seen in other studies, shape is the critical component for ancestry estimation, while sex estimation requires both shape and size for accurate classification. For estimating ancestry, only the principal components representing the shape variation between the American White and Black samples was necessary. Nevertheless, for estimating sex the addition of centroid size significantly improved the accuracy of the method. Based on this study, discriminant functions employing interlandmark distances that do not require a digitizer to observe are presented.

Morphpometrics, Sex, Ancestry

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