H58 Morphological Variation in the Cranial Base: Implications for Sex and Ancestry Estimation

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After attending this presentation, attendees will understand the patterns of morphological variation of the cranial base that characterize males and females and American whites and blacks and how this variation can be used to estimate sex and ancestry for unknown individuals.

This presentation will impact the forensic community and/or humanity by demonstrating how differences in the cranial base between males and females are primarily due to size, while variation among American whites and blacks are primarily due to shape. These patterns must be acknowledged when estimating sex and ancestry from this region of the human cranium.

This research uses three-dimensional coordinate data observed on crania from known sex and ancestry collections and the tools of geometric morphometrics to evaluate morphological variation in the cranial base. Standard statistical analyses are employed to assess the utility of using the size and shape variation to estimate sex and ancestry.

Variability in craniofacial morphology has been used successfully to estimate sex and ancestry for unidentified skeletal remains. While research has focused on the variation present in the face and cranial vault that permits relatively accurate assessments of sex and population affiliation, investigations into the morphological variation of the cranial base have been limited. Nevertheless, the research conducted thus far does suggest the presence of sex and ancestry based variation in the dimensions of the cranial base. As anthropologists are often confronted with fragmentary cranial remains, approaches to sex and ancestry estimation that utilize the cranial base can be useful. To further investigate the nature of the variation and assess its utility for sex and ancestry estimation, differences in size and shape are evaluated using three dimensional coordinate data observed on crania from known sex and ancestry collections.

The sample is comprised of crania of known sex and ancestry (American white and blacks) from the William M. Bass Donated Skeletal Collection (n=56) housed at the University of Tennessee and the Terry Collection (n=340) housed at the National Museum of Natural History, Smithsonian Institution. Sixteen landmarks from the cranial base were recorded as three dimensional coordinates and used for the analysis. The coordinate data was subjected to Procrustes fitting via a general least squares procedure that orients the configurations in a common coordinate system and scales the configurations to remove size differences. Size is retained in the centroid size for each configuration which permits the inclusion of this variable in analyses. Using the tools of geometric morphometrics, the fitted coordinates are used to explore shape variation between the sexes and among the groups. Further analyses based on the fitted coordinates and centroid size, including principal components and canonical discriminant analysis, were used to evaluate whether the size and shape variation present among the groups is useful for estimating sex and ancestry.

Differences in the cranial base between males and females are primarily due to size, while variation among American whites and blacks are primarily due to shape. These patterns must be acknowledged when estimating sex and ancestry from this region of the human cranium.

Sex, Ancestry, Geometric Morphometrics

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