A38 A Morphometric Analysis of the Neurocranium in an Adult South African Sample

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After attending this presentation, attendees will better understand the human variation among modern Black, White, and mixed-ancestry South Africans and will understand the statistical framework used to describe similarities and differences among these groups.

This presentation will impact the forensic science community by not only contributing to the knowledge of human variation in modern South Africans, but also by revealing a more accurate method of estimating ancestry and sex from full and partial crania in different ancestral populations occupying the same geographical space.

Many questions in anthropology relate to variation in shape of anatomical structures. Geometric morphometrics allow evaluation of shape variation by "removing" the effect of size and has been applied to many fields within anthropology, primarily utilizing the cranium. The high crime rate in South Africa makes it important to develop methods to gain information such as sex and/or ancestry from skeletal material that is likely to be recovered in a forensic context. This study examined morphological variation in the crania of a South African sample in relation to the associated demographic information and assessed the accuracy with which such information could be estimated.

The purpose of this study was to use cranial morphometrics to evaluate ancestral variation and sexual dimorphism among White, Black, and mixed-ancestry groups as a means to explain current variation and more accurately identify unidentified remains.

A total of 774 crania of Black (160F, 123M), White (90F, 130M), and mixed ancestry (104F, 167M) were used from the Universities of Cape Town, Stellenbosch (Kirsten), Pretoria, and Witwatersrand (Raymond A. Dart) skeletal collections with ages ranging between 20 to 100 years at death. A total of 11 to 12 landmarks for each cranial element was digitized to generate various linear measures, angles and subtenses, and 14 landmarks for the whole cranium. Discriminant function analysis was employed and South African groups were tested against themselves to test classification accuracies. All accuracies were cross-validated. Multivariate analyses were used to assess differences between sex, ancestry, and sex-ancestry groups.

The analyses demonstrate that males have relatively and absolutely larger crania than females. Females tended to have a slightly larger medio-lateral dimension of the cranium, but an antero-posteriorly longer occipital region compared to males. This resulted in a more steeply sloped forehead but less steeply sloped occipital region in females. This revealed that the frontal bone had the best results for classifying each of the sexes with between 75.5%-83.7% accuracies

The most accurate identifiers for ancestry in Black individuals were found on the frontal bone (88%). This was similar for the mixed-ancestry individuals (83.7%); however, for White individuals, the whole cranium was best for ancestry identification (90.2%).

These results illustrate that morphometric analysis of the frontal bone alone could be used to estimate certain demographic parameters, which may be used in constructing a biological profile for forensic purposes. The accuracy of such analysis is similar to or exceeds that of traditional analyses.

Ancestral Variation, Sexual Dimorphism, Geometric Morphometrics