



Anthropology Section - 2016

A91 Cranial Morphological Sexing Trait Patterns Differ Across Populations

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After attending this presentation, attendees will be aware of the similarities and differences in expression of four cranial morphological sexing traits between Egyptians and modern Americans. Further, attendees will understand the implications of these differences when applying the cranial morphological sexing technique, which could lead to an increase in the accuracy of estimating sex.

This presentation will impact the forensic science community by highlighting the limitations of the cranial morphological sexing method and showing how it can be applied successfully by knowing the morphological patterns specific to individual populations.

When applying the cranial morphological sexing technique, biological anthropologists adjust the method to suit the population under study. Population patterns in trait expression have not been formally published for testing and quantification in a forensic context. Thus, an evaluation of the different degrees to which cranial morphological traits are expressed across populations is necessary. The hypothesis this research tested was that traits of the cranial morphological sexing method differ in magnitude between modern Americans and Egyptians.

Two populations ($N=457$) were analyzed for each of the five major cranial morphological sexing traits: glabella, mastoid process, supraorbital margin, nuchal crest, and mental eminence. Modern Americans from two collections with documented sex, the William M. Bass Donated Skeletal Collection (Bass Collection) and Hamann-Todd, were observed on a scale of one through five for each of the five characteristics. The modern Americans represent inhabitants of rural and urban areas born during the past 186 years. The Egyptian sample is comprised of observations made on individuals from four sites, spanning Upper and Lower Egypt and from the Predynastic through the New Kingdom time periods. The Egyptian collection is curated in the Phoebe A. Hearst Museum of Anthropology at the University of California, Berkeley (UCB).

As the Egyptian sample had few associated pelvises to verify sex, cranial measurements from the Giza Egyptian sample in the Howell's data set were input into discriminant analyses to create a discriminant function for an estimate of sex on the UCB Egyptian sample. The result was 97% accuracy of Howell's measurements against Howell's assigned sex. This population-specific discriminant function from Giza was then applied to the UCB Egyptian sample to estimate sex from cranial measurements. Only skulls with 80%-and-above accuracy rates from the discriminant function were retained.

A two-tailed Fisher's exact test with the Freeman and Halton adaptation for RxC tables was executed on the data categorized by sex (documented or established by the discriminant analysis described above), population, and degree of expression per trait. Mental eminence was not assessed as few mandibles were preserved in the Egyptian sample and expression of mental eminence was obscured by dental disease or edentulism in many of the modern Americans from the Bass Collection. Eight cross-tabulation tables were generated, while sex was controlled, to assess population and degree of expression. Of these eight analyses, only one was not significant at $\alpha=0.10$ or higher (glabella in females), while the other results were all significant at the $\alpha=.01$ level. Thus, in general, the null hypothesis can be rejected; the probability a particular sex will exhibit the same degrees of expression regardless of population affiliation is not supported. In this study, the degree of expression of these traits is population specific. It can also be concluded from the cross-tabulation tables that modern Americans tend to have a higher degree of expression of these traits than Egyptians.

The results demonstrate that these four traits cannot be universally applied for estimating sex from the cranium. Hence, forensic practitioners should be aware that population specificity ought to be factored into the application of this method. As regards the American and Egyptian populations, forensic anthropologists should anticipate that higher trait scores (e.g., five in males and three in females) are more frequent in modern Americans and that this is not solely attributable to sex.

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Modern Americans, Population Specific, Discriminant Analysis