H24 Secular Trends in Cranial Morphological Sexing

Kanya Godde, MA, and Angela M. Dautartas, BS, University of Tennessee, 250 South Stadium Hall, Knoxville, TN 37996*

After attending this presentation, attendees will understand the changes in cranial morphological sex characteristics between individuals with birth years from the 1840s through the 1960s.

This presentation will impact the forensic community by extending an anthropologist's ability to properly assess sex in an unidentified individual. Awareness of the changes over time in skeletal morphology will strengthen skills for accurate construction of the biological profile.

Hrdlicka (1920) originally created the now popular cranial morphological sexing criteria based on his reading of various German and French papers. He did not standardize his method; rather, he mostly described the morphological features with size terms, such as "medium," and no sketches (Hrdlicka 1920: 91). In 1994, Buikstra and Ubelaker published sketches and descriptions of each morphological characteristic in order to standardize the method. Other than Buikstra and Ubelaker's (1994) contribution, 74 years after Hrdlicka's descriptions, the method has not been officially outlined.

Despite its lack of formal definition until 1994, the technique was used in anthropology since Hrdlicka's (1920) adoption of the methodology. Application of the technique has been taught with the caveat of needing to understand the variations in size and morphology in the population with which it is utilized. However, there has been little research on how cranial characteristics in the American population have changed over the last century and thus there is little insight into American morphological variation over time. Since the method was originally adopted in 1920, the American population has changed greatly due to proper nutrition and better healthcare, among other factors. These changes include increases in average weight, stature, and overall health. In order to properly employ the cranial morphological sexing technique in a forensic setting, anthropologists need to be aware of potential changes in morphology over time. This knowledge will help with assessing sex in forensic cases where bones are discovered decades after the individual's demise, as well as with contemporary cases. Thus, it is hypothesized that secular trends have also occurred in cranial morphology in Americans, which affects the utilization of the sexing technique.

In order to test the hypothesis, 516 male and female American Blacks and Whites from two skeletal collections (the Hamann-Todd Collection and the William M. Bass Donated Skeletal Collection) were observed for each of the five cranial morphological sexing characteristics. These traits include: mental eminence, supraorbital margin, supraorbital ridge, nuchal crest, and mastoid process. Additionally, Howell's mastoid measurements (mastoid length and mastoid breadth), and a new measurement, mastoid width, were collected in order to calculate the volume of mastoids. Mastoids resemble cones more than any other geometric shape, and thus the three measurements collected in this analysis were selected and designed to simulate this form. The birth years from these collections span more than a century; they range from the 1840s to the 1960s. The data were split into two samples based on sex (Cridlin et al. 2008), and each of these two samples was independently analyzed.

A time series statistical analysis was executed on transformed categorical and untransformed continuous variables for both sexes. The results indicate that over time the variables exhibited either a positive or negative trend. Most notably, supraorbital ridge increased over the last century.

The results here suggest that the secular trends in American Whites and Blacks warrant modifying the application of the technique to accommodate change over time in the American population. Recognition of these changes will strengthen the methodology behind building a biological profile. While these results reflect secular trends in the American population, they are not meant to be extrapolated to other populations. Each population has its own respective history and changes in skeletal morphology reflect events and trends within it.

References:

1 Buikstra JE, Ubelaker D. 1994. Standards for data collection from human skeletal remains: Proceedings of a seminar at the Field Museum of Natural History. Fayetteville: Arkansas Archaeological Survey, 1994.

2 Cridlin S, Seaver WL, Jantz RL. 2008. Change is good: using advanced statistical methods for the identification of secular change in femoral head size. Am J Phys Anthropol Supp 135: 84.

3 Hrdlicka A. 1920. *Anthropometry*. Philadelphia: The Wistar Institute of Anatomy and Biology.

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 ** Presenting Author*