H85 Are Cranial Morphological Traits Population Specific? A Reevaluation of Traditional Sex Estimation Methodology

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After attending this presentation, attendees will understand re-evaluation of traditional morphological cranial sex estimation methods in reference to specific population groups.

This presentation will impact the forensic community by helping to improve the standards upon which anthropologists rely for construction of the biological profile. Continual testing and alteration of these methods to reflect modern populations is essential to ensure the highest possible accuracy.

Visual analysis for sex estimation using the cranium and mandible as outlined by Buikstra and Ubelaker (1994) involves examination of five morphological traits on an ordinal scale, ranking from definite male to definite female. This system is well known, and has been commonly used by the forensic community for many years. Krogman tested the accuracy of this particular method by utilizing this particular suite of morphological traits in an attempt to identify the sex of 750 individuals from the Hamann-Todd collection (Krogman and Iscan, 1986). Although this collection included males and females of European and African ancestry, it was biased towards males of European ancestry. Even though Krogman returned a 92% accuracy rate from examining the skull alone, because of the bias towards European males, the actual accuracy of this system may be lower for a more diverse sample. Stewart (1979) also tested this method, examining 100 male and female individuals of African-American descent from the Terry collection. While he noted that his accuracy was only 77% for this population, he attributed the lower success rate to the fact that the sample was heavily male biased.

The aim of this study is to demonstrate that expression of cranial morphological traits are population specific, and therefore methods incor- porating these traits may not be appropriate for all ancestral populations. For example, female individuals of African or African-American descent have been noted to display cranial traits that tend to mislead observers when assessing sex. Mastoid processes are typically larger in females of African descent than females of European descent. When using the standard scale to determine sex, larger mastoids are considered strongly indicative of a male individual. This example demonstrates that techniques that do not account for differences among populations may be inappropriate determinants of sex.

In order to test our hypothesis, a sex estimation analysis of adult male and female individuals of African-American ancestry from the William Bass Donated Collection was completed. Each of the five morphological traits were visually examined and rated according to the scale set down by Buikstra and Ubelaker. The resulting estimation was then compared to the individual's actual known sex.

In order to evaluate the accuracy of using mastoid processes alone as determinants of sex, metric estimation was also completed. Measurements of mastoid length and mastoid breadth were obtained from the Forensic Anthropology Data Bank. These measurements were used to compute mastoid area separately in males and females of both European and African ancestry. Subsequently the measurements of each sex were compared across the populations to investigate any differences between the two groups. A t-test was used to determine if any significant differences do exist.

Our results indicated that traditional morphological indicators of sex can reflect populational variation. Certain traits including the mastoid process, supraorbital margin and supraorbital ridge were expressed differ- ently between the two ancestral groups. When the scale found in Buikstra and Ubelaker (1994) was applied to the populations without regard to ancestral differences, our accuracy rating was 79%. When the populations were separated and the Buikstra and Ubelaker scale was adjusted for ancestral differences, our accuracy rating increased to 88%. Further, mastoid measurements indicated that significant differences do exist between individuals of European ancestry and individuals of African or African-American ancestry.

The results here suggest that cranial morphological traits are not only sex specific, but population specific, as well. Since sex determination accuracy increased when population specific scales were used, it is recom- mended that the method be revised to state that it is best applied to indi- viduals of European descent and alternative scales be developed for other ancestries.

References:

1 Buikstra JE, Ubelaker D editors. 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 Krogman WM, Iscan MY. The human skeleton in forensic medicine. Springfield: C.C. Thomas, 1986. Stewart TD. Essentials of forensic anthropology. Springfield: C.C. Thomas, 1979.

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