



## Physical Anthropology Section - 2013

### H7 Patterns in Worldwide Craniometric Sexual Dimorphism and Its Importance in Forensic Anthropology

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After attending this presentation, attendees will understand that differing degrees of craniometric sexual dimorphism among world populations can significantly impact sex estimation.

This presentation will impact the forensic science community by serving as a resource for understanding variation in worldwide craniometric sexual dimorphism and thus, considerations for more accurate sex estimation.

Forensic anthropologists frequently encounter individuals from a variety of ancestral backgrounds in American casework as well as global human rights cases and mass fatalities. The degree of craniometric sexual dimorphism varies among different populations and it is especially important for forensic anthropologists to keep these differing degrees of craniometric sexual dimorphism in mind when assessing sex. Guyomarc'h and Bruzek noted that applying Discriminant Function Analysis (DFA) from modern American craniometric data to a Thai sample resulted in poor classification accuracy.<sup>1</sup> The low classification accuracy in their Thai sample is likely a result of differing levels of craniometric sexual dimorphism between populations in addition to different population sex-specific means. Indeed, the sex-only function in FORDISC 2, which pooled samples of males and females from several groups, was removed in FORDISC 3 because Hispanic males were often misclassified as females.<sup>1-3</sup>

In order to analyze the differing degrees of craniometric sexual dimorphism among world populations, 13 measurements were analyzed from a modern Thai sample from Khon Kaen University Hospital (n=114), modern South African blacks from the University of Pretoria (n=84), and modern samples from the Forensic Data Bank (n=695), as well as 26 population samples that include both males and females from the W.W. Howells Data Set (n=2412). The statistical program R was used to run analyses of the craniometric data.<sup>4</sup> The pairwise Mahalanobis distance ( $D^2$ ) was used as a measure of the difference between males and females within each group in order to isolate sex differences from ancestry differences, in contrast to pooling all groups in canonical variates analysis, where sex and ancestry influence the differences simultaneously. The classification percentages for males and females were calculated in FORDISC 3.1 for each group. The Easter Island group had the highest classification accuracy (96.5%) indicating a high degree of difference between males and females, making it easier to differentiate between the sexes. The Thai group had the lowest classification accuracy (72.8%), meaning that the males and females were more similar to one another and more difficult to differentiate. That is not generally true for all Asian populations, which are quite variable in the degree of craniometric sexual dimorphism. For example, the Ainu group had a classification percentage of 92.1% while the Atayal had a classification percentage of 74.5%.

The Thai and South African Black groups were the least sexually dimorphic in both the facial and vault measurements while the Easter Island sample was the most sexually dimorphic in both the facial and vault measurements. This shows that a small male from a group such as the Thai could easily be mistaken for a female of another group, such as Easter Island. In general, as the degree of sexual dimorphism in the face increased, the degree of sexual dimorphism in the cranial vault also increased.

The results of this paper further indicate that there are craniometric trends across nearly all samples from around the world. Using stepwise selection in FORDISC 3.1, the first three measurements of the 13 considered that were most important in the discrimination between males and females were related to cranial lengths (glabella-occipital length, nasio-occipital length) and facial width (bizygomatic breadth).

In conclusion, these findings confirm the importance of understanding that levels of sexual dimorphism vary between populations and this can help us interpret classification percentages in DFA and appreciate that sex assessment may be more difficult in those populations where males and females are more similar, such as the Thai, or where smaller males of one group may be confused for females of another group. With more investigations in many parts of the world, the challenge of population-specific methods becomes more important and this study functions as preliminary research into this question in order to formulate more accurate sex estimation in forensic anthropology.

#### References:

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#### Sexual Dimorphism, Craniometrics, Sex Estimation