H84 Sexual Dimorphism in Thai Postcranial Measurements

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After attending this presentation, attendees will understand the methods associated with sexing the skeleton, the different levels of sexual dimorphism in the skeleton and also in different populations around the world, and an example of the importance of selecting the most valid methods for the level of dimorphism.

This presentation will impact the forensic science community by raising awareness of the different levels of accuracy of sex estimation methods for different populations, and the importance of population-specific validation of metric and nonmetric methods in responsible biological profile assessment.

Sexual dimorphism has been observed and recorded in populations around the world for over a century, with recognition that different groups show different levels of sexual dimorphism. Nevertheless, forensic anthropologists universally apply nonmetric methods that focus on particular traits of the cranium and innominate for estimating sex of unknown individuals, regardless of suspected ancestry.[1,2] Furthermore, multiple methods are expected to yield equivalent levels of sexual dimorphism for a particular individual. Consequently, adherence to the *Daubert* standard of method validation is undermined by a lack of population-specific error rates in sex estimation methods.[3]

Recent published and unpublished results have indicated low degrees of sexual dimorphism in Thai crania, and moreover, typical sex markers of the postcranial skeleton, such as the pubis, appear to be less sexually dimorphic than contemporary American populations.[4] In contrast, high levels of sexual dimorphism have been observed in the postcranial skeleton of Thai in the examination of single bones (femur, tibia, and humerus), despite a generally smaller physique compared to other East Asian populations.[5] Therefore, it is necessary to compare the extent and location of dimorphism in the entire Thai postcranial skeleton as a potential alternative for biological profile assessment in which the traditional Walker and Phenice markers are less valid.

In this study, a modern sample of 122 males and 78 females from Khon Kaen University, Thailand, were compared to modern American Whites and Blacks in the Forensic Data Bank, with the objectives of testing the classification accuracy of postcranial metrics using Discriminant Function Analysis (DFA), as well as to identify the most dimorphic skeletal traits in each group. Each ancestral group was analyzed independently for seven robusticity indicators (breadth measurements) of the humerus, femur, and tibia, and for seven length measurements of the clavicle, humerus, radius, femur, and tibia, using discriminant function analysis in FORDISC 3.1 and R statistical software programs. Forward stepwise selection was conducted to determine which measurements were most effective for differentiating sex in each ancestral group.[6,7] In all groups, robusticity indicators outperformed length measurements, achieving classification accuracies of 95.0% (White), 95.6% (Thai), and 97.8% (Black), compared with 92.6% (White), 93.0% (Thai), and 95.3% (Black). When all 14 measurements were combined, robusticity indicators continued to be more valuable characters for estimating sex.

When stepwise selection was used, classification accuracies were similar in all groups, exceeding 90%, but the Thai groups required five measurements for distinguishing males and females, in contrast to two measurements that were selected for each of American Blacks and Whites. Thus, Thai males and females can be classified with similarly high rates of accuracy, but sexual dimorphism is more pronounced in American Blacks and Whites.

Sexual dimorphism in the Thai illustrates the differential accuracy of sex estimation methods in different populations. Although the results indicate that dimorphism may be lower in Thais than in American Whites or Blacks, postcranial metrics can still be used to estimate sex accurately, in contrast to the typical nonmetric methods. In the wake of *Daubert*, the Thai sample emphasizes the importance of utilizing the most reliable and valid method in assessing parameters of biological profile.

References:

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Sex Estimation, Postcranial Metrics, Method Validation

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