



Physical Anthropology Section - 2014

H23 Metric Assessment of Sexual Dimorphism in the Scapula: A Validation Study

Janet E. Finlayson, BS*, California State University, Chico, Dept of Anthropology, #311 Butte, 400 W First Street, Chico, CA 95929-0400

After attending this presentation, attendees will understand the utility of the scapula in forensic sex estimation in adults.

This presentation will impact the forensic science community by widening the array of validated methods available for sex estimation of skeletal individuals, thus complying with evidentiary standards outlined in the *Daubert* guidelines.

Furthermore, variety in methodology involving single skeletal elements increases the accuracy of the biological profile constructed for individuals with missing or damaged elements that are commonly referenced, especially when used in conjunction with other single-element methods in a multifactorial approach.^{1,2}

The purpose of this study is to test the validity of a two-variable method of metric sex estimation using the maximum breadth and maximum length of the scapula, as introduced by Dabbs and Moore-Jansen in 2010.³ In the Dabbs and Moore-Jansen study, two discriminant function equations are presented, one involving two variables and one involving five variables. The two-variable function has greater applicability to researchers due to the simplicity of the measurements and instruments required, and therefore is the subject of this validation study. The scapular breadth and length measurements are inputted into this discriminant function equation and the result is a value greater or less than zero, the male-female threshold. A positive value classifies the scapula as male, and a negative value classifies the scapula as female. This method was developed on late 19th-early 20th-century Black and White individuals from the Hamann-Todd collection. However, it has been shown that individuals from this era do not fully represent the variation seen in modern populations.^{4,5}

This retrospective study tests the Dabbs and Moore-Jansen two-variable method on 73 scapulae from a total of 38 positively identified decedents brought to the Harris County Institute of Forensic Sciences (HCIFS) for autopsy pursuant to Article 49.25 of the Texas Code of Criminal Procedures. At autopsy, these decedents were unidentified and in varying stages of decomposition, from moderate to advanced. Therefore, anthropological examinations were required to assist in identification or other supporting analyses.

For this study, all available complete scapulae were analyzed to first assess effects of bilateral asymmetry. This sample included a total of 73 scapulae from 38 females and males of Black (F=2, M=7), White (F=8, M=16), and Hispanic (F=1, M=4) ancestry. All were represented by bilateral scapulae in the sample except for one White male, one White female, and one Hispanic male, who were represented unilaterally. The Hispanic sample was evaluated to test the method's applicability on non-Black and non-White populations. Anthropological case reports and bench notes written by four different HCIFS anthropologists were reviewed and the maximum scapular breadth and maximum scapular length measurements were recorded. These measurements were then entered into the Dabbs and Moore-Jansen discriminant function to estimate sex, and the results were compared to the decedent's known sex. Bilateral asymmetry had no effect on the classification of any individuals. Thus, the left scapula (if unavailable, the right scapula) was selected from each of the 38 decedents to calculate accuracy in percentage of correct sex classifications.

Results suggest that performance of the two-variable method is best when applied to certain subgroups within forensically modern populations. When using the method on Black and White individuals, the overall accuracy is 93.75%. Within the Black population, the accuracy is 77.78% due to misclassification of both Black females. The two-variable method performed very well within the relatively large White population with 100% correct sex classification. In Hispanic populations, accuracy is 60% due to misclassification of two males as female. As noted by Spradley *et al.*, there is a tendency for misclassification of Hispanic males as female in metric analysis.⁶ An overall accuracy of 89.47% is observed when applied across all populations.

This study demonstrates that the Dabbs and Moore-Jansen two-variable method for sex estimation using scapular metrics is potentially a useful tool for forensic anthropologists when analyzing unknown skeletal remains. However, the method presents low accuracy when applied to the small samples of HCIFS Black females and Hispanic males, suggesting the need for a larger test sample with stronger representation of each subgroup to determine true applicability.

References:



Physical Anthropology Section - 2014

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Sexual Dimorphism, Metric Analysis, Scapula