H32 Estimating Sex from the Human Skeleton: A Validation Study on Recent Scapular Methodologies with Emphasis on Population Diversity

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After attending this presentation, attendees will have a better understanding of population diversity as it relates to recent methodologies established for estimating sex from the human scapula.

The presentation will impact the forensic science community by introducing and validating pervious methodologies established for estimating sex on different population groups.

The objectives of the study were to determine which methodologies by Dabbs and Moore-Jansen (2010) are more accurate and which are more reliable to the forensic investigator; to examine, through metric analysis, the sexual dimorphic traits of the human scapula; and to better understand the relationship between biological sex and population differences.[1]

One of the integral parts of developing the biological profile is the estimation of sex. Not only does it constitute a large part of the biological profile, but it provides for a better understanding of other elements of the profile. Methodologies for age-at-death and stature are generally sex specific and if there are no accurate methodologies to estimate sex, an entire individual may go unidentified. The human pelvis, skull and various long bones have been shown to be the best predictors of sex for an osteologist. Unfortunately, within a forensic and archaeological context, degradation of the skeletal material may render these bones unusable to the investigator. Therefore research to investigate new methods of estimating sex from other skeletal elements is crucial. Since 1887, the human scapula has shown potential for estimating sex through metric analysis.

In this study 298, contemporary white European individuals (168 males and 130 females) were used from two different skeletal collections: The William H. Bass Collection at the University of Tennessee, Knoxville and the Athens Bone Collection at the University of Athens, Greece. The methodologies follow those outlined in Dabbs and Moore-Jansen (2010) in which only left scapulae were used to measure six landmarks.[1] These six measurements were used in two previously established discriminate function equations to estimate sex of an individual (the "five-variable model" and "two-variable model"). Those measurements were: the maximum length of the spine, maximum height of the scapula, maximum breadth of the scapula, height of the glenoid prominence, lateral curvature, and the thickness of the lateral border.

Using a two sample t-test to compare the Greek population with the North American population, the results indicate that four out of the six measurements were statistically different for males and one measurement was statistically different for females ($p\text{-value} \leq 0.05$). Similar results were found when two sample t-tests were used to compare each population group with the results of Dabbs and Moore-Jansen (2010).[1] This indicates that, with regard to these six measurements, the two population groups are statistically different. Inter- and intra-observer error was performed on both population groups. However, the overall accuracies for correctly identifying the sex of the individual from the "five-variable model" for both the Greek and North American populations were: 91.89% in males, 85.18% in females and 96.80% in males, 94.73% in females, respectively. The overall accuracies of the "two-variable model" for both the Greek and North American populations were: 85.13% in males, 87.03% in females and 94.68% in males, 82.89% in females, respectively. To test for statistical similarities of these accuracies a chi-squared test was performed. The results indicate that the "two-variable model" for estimating sex in males is statistically different between the Greek and North American population groups ($p\text{-value} \leq 0.05$). This could be a consequence of age. The "two-variable model" uses the maximum height and breadth of the scapula. As male individuals age, the ventral curvature of the scapula increases and the maximum height of the scapula decreases, which could have a direct impact on the "two-variable model" (Dabbs).[2] Further research could be done to confirm those findings.

Results show that although there are statistical differences in scapular measurements between the two population groups there is still a high overall accuracy of the two methodologies presented by Dabbs and Moore-Jansen.[2]

References:

1. Dabbs GR, Moore-Jansen PH. A method for estimating sex using metric analysis of the scapula. J Forensic Sci 2010;55(1):149-52.
2. Dabbs GR. Is Dwight right? Can the maximum height of the scapula be used for accurate sex estimation? J Forensic Sci 2009;54(3): 529-30.

Sex Estimation, Population Diversity, Scapula

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