A17 Establishing Postcranial Sex Estimation Criteria for Unidentified Migrants at the United States-Mexico Border

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Learning Overview: After attending this presentation, attendees will better understand the need for broader, population-oriented sex estimation criteria that encompass biological variation of current migrant groups perishing at the United States-Mexico border.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by highlighting the utility of a multi-regional postcranial sex estimation method for the identification of Latin American migrants at the United States-Mexico border.

Sex estimation is a critical part of the biological profile that greatly assists in the identification of unknown individuals. With increasing numbers of Central Americans and Mexicans crossing the United States southern border, the need for sex estimation criteria that encompass the biological variation of unidentified migrants remains critical. The current research addresses whether univariate analyses of postcranial measurements can be used to develop accurate sex classification criteria for unidentified migrants from varied regions in Latin America. Additionally, the current research compared the multi-group univariate criteria to two current postcranial sex estimation methods developed for Mexican and Guatemalan Hispanics to assess their relative classification accuracies.[1,2]

Utilizing a combined sample of 417 (315 males, 102 females) known-sex Central American and Mexican individuals from the Forensic Anthropology Foundation of Guatemala, Operation Identification, the Pima County Office of the Medical Examiner, Universidad Nacional Autónoma de México, and Universidad Nacional Autónoma de Yucután, analysis of variance was conducted on 42 postcranial measurements to generate sectioning points to serve as sex estimation criteria. In order to test classification accuracies, 18 measurements with significant F-values were applied to a test sample of 29 known-sex individuals not included in the original analyses. Classification accuracies for the test sample were above 80.00% for 5 of the 18 measurements, with scapula maximum height performing best at 94.74%, followed by humerus maximum head diameter at 91.30%, and tibia maximum diameter at the nutrient foramen at 85.71%. Classification accuracies were overall better for males than females.

To compare the classification accuracies of the current Mexican (Spradley et al.) and Guatemalan (Fowler and Hughes) Hispanic postcranial sex estimation methods, all sectioning points generated by each method were applied to the same validation sample of 29 known-sex individuals.[1,2] Of the nine sectioning points from the Spradley et al. method, three produced classification accuracies above 85%, with the scapula height performing best at 95.74%, followed by femur maximum head diameter at 88.46%, and humerus epicondylar breadth at 88%.[1] The humerus maximum head diameter, scapula maximum height, and tibia maximum diameter at the nutrient foramen performed well for both the present univariate analysis and in the Spradley et al. method.[1] Of these three corresponding top-performing measurements, sectioning points for humerus maximum head and scapula maximum height were a millimeter smaller in the new criteria than those generated by the Spradley et al. method, suggesting their applicability to individuals of smaller body sizes.[1]

The Fowler and Hughes method produced one top-performing sectioning point, with the glenoid cavity height performing at 90% classification accuracy.[2] Of the nine measurements in the Fowler and Hughes criteria, eight sectioning points performed above 80% in males, while two performed above 90% in females, suggesting that classification accuracies decrease when sectioning points are applied to larger body sizes.[2] The sectioning point for the femur maximum head diameter for the Fowler and Hughes method was also identical to the one generated by the new criteria, performing at 84.62%.[2]

Combining the best-performing sectioning points from the current Guatemalan and Mexican Hispanic methods with the newly developed multi-group criteria may serve as the most accurate univariate approach for postcranial sex estimation for unidentified migrants. Future studies will apply these univariate criteria to additional groups of known-sex individuals, as well as develop multivariate criteria as more population data become available. Results will be discussed within the framework of population structure.

Reference(s):

1. Spradley M.K., Anderson B.E., Tise M.L. Postcranial Sex Estimation Criteria for Mexican Hispanics. *J Forensic Sci* 2015:60(S1):27- 31.
2. Fowler G., Hughes C. Development and Assessment of Postcranial Sex Estimation Methods for a Guatemalan Population. *J Forensic Sci* 2018:63(2):490-96.

Sex Estimation, Unidentified Migrants, Biological Variation

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