H11 A Comparison of Metric and Non-Metric Techniques Used in the Classification of Hispanic Crania

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The goal of this presentation is to evaluate and compare standard metric and non-metric techniques commonly used in the classification of Hispanic crania. Attendees will have an increased knowledge of the applicability and accuracy of various metric and non-metric techniques in the determination of Hispanic ancestry.

This presentation will impact the forensic science community by illustrating the issues and complexities involved in accurate identification of Hispanic crania. It highlights the utility, importance, and need for correlation of both metric and non-metric data in the successful classification of these hybrid crania.

In the post-*Daubert* forensic community, there has been a push to abandon more traditional, experience-based methods in favor of those that are more statistically rigorous and replicable. While this is of utmost importance in terms of achieving reliable results that affect the outcomes of legal situations, there may be situations in which methods based on experience may prove their worth. One such instance where this is evident is the attribution of ancestry to cranial remains of Hispanic decedents. The difficulty of successfully classifying Hispanic crania has previously been noted.[1] Because Hispanic individuals can be culturally and genetically heterogeneous admixtures of Native Americans, African Blacks, and European Whites, trait expression varies and is often intermediate between extremes. This Presentation aims to evaluate morphological traits associated with Hispanic crania and compare their success in classification to metric trait analyses to determine which mode of analysis is able to better identify a sample of Hispanic crania.

A blind sample of 50 male and female crania from the William M. Bass Donated Skeletal Collection was utilized in this study. Metric analysis of these crania consisted of discriminant function analysis through the use of FORDISC® 3.1 using a standard suite of 24 cranial measurements.[2] Crania were also digitized and classifications achieved using Geometric Morphometric (GM) methods. Nonmetric traits recorded from each cranium followed those described by Birkby *et al.*, Hurst, and Peacock and Zinni and included estimation of alveolar prognathism, nasal overgrowth, nasal aperture width, nasal spine development, supranasal suture morphology, eye orbit shape, shoveling of the incisors, as well as morphology of the frontal process of the zygomatic.[3-5]

The use of non-metric traits resulted in correct classification of nearly 77% of the Bass Hispanic crania. Using all-group classifications, FORDISC® 3.1 was able to correctly classify 31% of the Hispanic sample; however, when Mahalanobis distance matrices and canonical variates plots were considered, successful classification rates improved significantly. GM analysis of Bass crania, when combined with non-metric assessments, provided the most accurate Hispanic crania classification rate. These results illustrate that although metric methods for Hispanic ancestry classification can be applied more objectively and replicated more easily in forensic anthropology, correlation of morphological (i.e., nonmetric) methods with metric methods can potentially provide results not attainable by either used alone.

References:
1. Spradley MK, Jantz RL, Robinson A, Peccerelli F. Demographic change and forensic identification: Problems in metric identification of Hispanic skeletons. J Forensic Sci 2008;53(1):21-8.
2. Jantz RL, Ousley SD. FORDISC® 3: Computerized forensic discriminant functions. Version 3.1. Knoxville, TN: University of Tennessee, 2005.
3. Birkby WH, Fenton TW, Anderson BE. Identifying southwest Hispanics using nonmetric traits and the cultural profile. J Forensic Sci 2008;53(1):29-33.
4. Hurst CV. Morphoscopic trait expressions used to identify southwest Hispanics. J Forensic Sci 2012;57(4):859-65.
5. Peacock SJ, Zinni DB. Craniometric and non-metric assessment of skulls of Hispanic descent. P Am Acad Forensic Sci 2012.

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