H12 The Utility of Nonmetric Cranial Traits in Ancestry Determination - Part II

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The primary goal of the current study is to provide the audience with an overview of the state of nonmetric trait analysis in ancestry determination, and to test the utility of five traits in the classification of unidentified human crania.

The determination of ancestry is extremely useful for limiting the number of antemortem record searches during the forensic investigation of unidentified human remains. Most often, this determination – almost exclusively using the cranium – relies upon the combination of the assessment of a number of unique morphological features (nonmetric traits) and metric analysis of the shape of the skull. Evaluations utilizing nonmetric traits may be effective for predicting ancestry but relies on the observer's experience. Furthermore, the frequency of many of these traits among populations has not been examined in full and the range in variation of these traits is often not considered in ancestry prediction studies resulting in the loss of existing gradations that are observed (Brues 1991).

Considering this deficiency in the existing body of data, 17 nonmetric cranial traits were documented for 762 individuals from 20 populations throughout the world (European, n = 185; Asian, n = 156; American Indian, n = 241; African, n = 180) curated at the National Museum of Natural History, Smithsonian Institution. Last year (Hefner 2002) five of these traits were discussed: inferior nasal aperture, nasal bone structure, nasal aperture width, interorbital breadth, and post-bregmatic depression. These five traits were shown to have only a minimal predictive value for ancestry. In this presentation, discussion will focus on the morphological variation and frequency distribution of five additional cranial traits. The traits include anterior nasal spine prominence, zygomaticomaxillary suture shape, transverse palatine suture shape, posterior zygomatic tubercle, and malar tubercle.

First, each trait was examined and character states were defined, or, when appropriate, trait values from previous studies were utilized. Next, new anatomical terms and definitions were developed for character states not previously described. If possible, each trait was scored on a four or five-level scale, thus permitting the inclusion of intermediate morphologies. In this manner, each trait was scored progressively (i.e., Posterior Zygomatic Tubercle: 0 = absent; 1 = weak; 2 = incipient; 3 = medium; and 4 = strong). Finally, in an attempt to properly quantify the morphological variability, standard frequency distributions for each of the character states were calculated. In addition, polychoric correlations were computed for all traits to determine inter– and intra-population variability.

Ancestry determination from nonmetric traits classically relies on assessing whether a particular skull exhibits trait values that are believed to be representative of a given ancestral population (e.g., 'angled' zygomaticomaxillary suture in Asian and Native American individuals). In the current study, individuals possessing all five expected trait values ranged from 10.24% (13/127) for European individuals to 12.21% (21/172) for African individuals. Frequency distributions for most traits do not show significant differences between ancestral groups, with the possible exception of the transverse palatine suture. In this sample, 34.8% (64/184) of the Europeans possessed a "bulging" (asymmetrical) transverse palatine suture, 54.5% (90/165) of the Asian sample possessed a "straight" transverse palatine suture, 64.3% (207/322) of the Native American population possessed a "straight" transverse palatine suture, and 46.7% (64/184) of the African sample possessed an "anterior bulging" (symmetrical) transverse palatine suture. This agrees, to some degree, with the published results of Gill (1998). Polychoric correlations were statistically insignificant for all five traits in the current study. This lack of strength in association tentatively suggests that these traits may not be useful for clustering in ancestry prediction studies.

These data appear to undercut the predictive value of these traits. Further research is necessary for the traits currently used by forensic anthropologists in making a determination of ancestry. The production of detailed, anatomically based descriptions that record the variability in trait expression, and recording the frequencies of these traits among populations, will greatly enhance the forensic anthropologist's ability to determine ancestry through visual means.

Ancestry, Nonmetric Traits, Human Identification

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