A13 The Utility of Postcranial Non-Metric Traits in Ancestry Analysis

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After attending this presentation, attendees will be familiar with a novel approach to analyzing postcranial non-metric traits and how these variations may be used to estimate the ancestry of individuals in a forensic context.

This presentation will impact the forensic science community by addressing a notable gap in forensic anthropological literature regarding the usage of postcranial non-metric traits, which will assist in future approaches to ancestry estimation.

This research project sought to create a visual method for scoring a suite of postcranial non-metric traits, to define and illustrate the traits being used in the method, and to compare these postcranial non-metric traits between ancestral groups.

To begin, a categorical scoring method was created to analyze the usability and frequency of post-cranial non-metric variation between ancestral groups.[1] Based on a comprehensive survey of the literature, 11 different traits were used in this study. Due to discrepancies in the definitions and photographs of these traits throughout various studies, new definitions, trait states, and illustrations were created. Next, these 11 traits were observed and recorded on a sample of 210 specimens from the Robert J. Terry Anatomical Skeletal Collection, including American Black (n=105) and American White (n=105) individuals. Frequency distributions were calculated after data collection to depict the differences between the American Black and American White as different ancestral groups. After creating contingency tables for each trait, Chi-square tests were utilized to determine statistically significant differences between the two ancestral groups. Using these contingency tables, correspondence analysis was run using code modified from previous cranial non-metric trait analysis to create two-dimensional biplots visually demonstrating the relationships between American Blacks and American Whites.

Results indicate that, of the 11 traits analyzed, five had statistically significant differences between the two ancestral groups when running Pearson's Chi-square test with a significance level of $p < 0.05$. These traits include the spinous process bifurcation for both the third and fourth cervical vertebrae (C3: $x2$=60.9738, df=2, P <0.00001; C4: $x2$=39.96, df=2, P <0.00001), septal aperture ($x2$=13.6159, df=1, P=0.0035), third trochanter ($x2$=17.3744, df=1, P=0.000031), vastus notch ($x2$=4.3063, df=1, P=0.0379), and the anterior and middle calcaneal facets ($x2$=26.5157, df=3, p <0.00001). These results were mirrored in both the frequency charts and, in turn, the correspondence analyses.

While the frequencies and Chi-square results of these traits are not enough to be used in isolation, this analysis of a non-metric postcranial trait list identifies the necessity for further research in these traits and their associations with ancestry estimation. This creation of the postcranial trait list will enhance the ability to visually ascertain ancestry. Further documentation of more populations paired with additional statistical analyses will allow forensic anthropologists to rely on scientifically tested data rather than relying on personal experience of visually estimating ancestry.

Reference(s):

1. Hefner J.T. The statistical determination of ancestry using nonmetric traits. (PhD diss., University of Florida, 2007).

Ancestry, Non-Metric Variation, Postcranial Skeleton