A76 Variation in Pubic Body Shape in Hispanic and Euroamerican Populations and the Implications for Assessing Biological Sex From Skeletal Remains

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Learning Overview: After attending this presentation, attendees will have a better understanding of the range of human variation in the shape of the pubic bone and will be able to apply this understanding to more reliably evaluate biological sex. Additionally, attendees will gain an understanding of the use and effectiveness of Elliptical Fourier Analysis (EFA) for describing human skeletal variation. The learning objectives include: (1) identifying the range of variation in the shape of the human pubic bone, (2) demonstrating the wider range of variation in Hispanic populations and in males, (3) understanding that the vast majority of skeletal variation in morphology cannot currently be explained, and (4) demonstrating the usefulness of EFA in descriptive studies.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by illustrating the importance of understanding the complexity of shape variation in the human skeleton.

Sex determination is a critical step in the creation of a biological profile to aid in the identification of human remains; a positive identification of skeletonized remains is often not possible until the decedent's biological traits have been evaluated accurately, narrowing the range of possible matches. One of the most reliable indicators of sex in the human skeleton is the pubic bone, a highly sexually dimorphic bone due to the constraints of childbirth in females. Current methods for sex determination based on the pubic bone depend on somewhat subjectively defined observations of complex morphological features and are thus prone to inter- and intra-observer error. Additionally, many of these methods are based on North American populations alone and therefore may not accurately model the variation that exists in other populations.

In this study, EFA was conducted using photographs of 451 pubic bones of individuals of North American Hispanic (39), Chilean (121), and Euroamerican (286) descent. Principal Components Analysis (PCA) then determined the patterns of variation in the shape of the pubic bone. Analysis of Covariance (ANCOVA) was run to determine which covariates (sex, age at death, ancestry, and the interaction between sex and ancestry) significantly affect these shape patterns. These data were analyzed to address the null hypotheses that there are no significant differences in the shape of the pubic body: (1) between males and females, (2) between Hispanics and Euroamericans, (3) between individuals of different adult ages, or (4) as a result of any interaction between sex and ancestry.

EFA generated five effective Principal Components (PCs), which together described approximately 95% of the overall variation in the shape of the pubic bone. The covariates that were found to significantly influence these shapes include sex, ancestry, and age at death; the interaction between sex and ancestry was not significant. The significant covariates explained only 25% of the overall variation in the shape of the pubic bone, with the majority of this explained by sex alone. Differences between Hispanics and Euroamericans were consistently small. The remaining 75% of shape variation that cannot be explained is likely influenced by other variables not controlled for in this study.

EFA was found to be an effective tool for describing variation but is difficult to apply in a practical setting. EFA did, however, demonstrate that the pubic bone of Hispanic populations does not substantively differ in shape from those of Euroamericans. Hispanics are significantly understudied and underrepresented in the methods currently in use in the United States. This study demonstrates that the pubic bone can be used as a reliable determinant of sex for the populations included in the sample, and that the majority of variance in skeletal morphology remains unexplained.

Forensic Anthropology, Human Variation, Biological Profile