



## A78 Analyzing Morphometric Methods of Race Differentiation in the Human Pelvic Girdle

Laura Yurka, MA\*, Mississippi State Medical Examiner's Office, 215 Allen Stuart Drive, Pearl, MS 39208

After attending this presentation, attendees will understand the importance of replication studies in adequately assessing the reproducibility of scientific methods prior to implementation for casework.

This presentation will impact the forensic science community by providing results from a replication of previously published morphometric methods to differentiate race in the human pelvic girdle. This presentation will highlight the need for comprehensive validation of methods employed by forensic anthropologists and stricter adherence to current statistical standards.

Research has shown that measurements from the pelvic bones and femur can be used for race estimation when the skull is absent or damaged.<sup>1,2</sup> The literature reported up to 95% accuracy when utilizing discriminant function analysis to simultaneously classify race and sex.<sup>1,2</sup> This study attempted to replicate the findings of two previously published methods of race estimation from the pelvic girdle while evaluating them within the guidelines for admissible forensic evidence.<sup>3</sup> It also sought to update the methods where necessary to conform to current statistical standards.<sup>4,5</sup>

This study strove to keep as many variables as possible consistent with the prior research in an attempt to adequately assess the validity of the methods. Both DiBennardo and Taylor, and İscan utilized the Robert J. Terry Skeletal Collection for the development of their discriminant functions; however, there are concerns that this collection, and collections like it, are no longer representative of populations in the United States and may not be useful for the development of forensic identification methods.<sup>6</sup> To address these concerns, the sample population from the Robert J. Terry Collection was supplemented with individuals from the more contemporary William M. Bass Donated Skeletal Collection, and descriptive statistics from the two skeletal collections were compared. The study sample consisted of 100 individuals each from the Robert J. Terry collection and the William M. Bass collection. A series of 19 metric measurements were recorded across the reassembled pelvic girdle, left innominate, sacrum, and left femur for each individual. The methods for reassembling the pelvis were derived from Bonneau et al. and Peleg et al, and four measurements described by İscan were recorded.<sup>2,7,8</sup> The bones were then disassembled to record the remaining 15 measurements described by DiBennardo and Taylor.<sup>1</sup>

Statistical analysis was conducted using SPSS and Excel® software and included descriptive statistics, student *t*-tests, multiple discriminant function analysis, and Analysis Of Variance (ANOVA). Statistical significance for metric evaluation is typically set at 95% confidence, meaning there would be a 5% probability ( $p < 0.05$ ) that the difference between groups is caused by chance alone.

Neither method sufficiently separated unknown skeletal remains by race. When the methods were modified to conform to current statistical standards, the overall accuracy fell considerably. The reproductions for DiBennardo's and Taylor's and İscan's discriminant function analyses yielded accuracy rates of 85.8% and 60.4%, respectively, for the original grouped cases, and 80.7% and 58.9%, respectively, for cross-validated grouped cases.<sup>1,2</sup> These results were substantially lower than those reported in the literature. Thus, the results of the published literature were not reproduced in this study, nor did they adequately meet the standards for admissible evidence in a court of law. Furthermore, descriptive statistics revealed that more variations exist within African American and Caucasian American populations in the United States than among them.

The implications of this research demonstrate the need for more rigorous validation of published morphometric methods, emphasizing replication studies and comprehensive reviews of sample populations and statistical procedures prior to utilization for forensic anthropology casework.

### Reference(s):

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### Anthropology, Morphometrics, Validation