H52 An Assessment of a Simple Model and Method for Osteometric Sorting

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The goal of this presentation is to introduce participants to an alternative method for osteometric sorting of paired elements.

After attending this presentation, attendees will learn that alternatives to the paired elements model and method introduced by Byrd (2008) will yield a higher percentage of correct classification. The aforementioned method is examined for the distribution of the parameter "D" as well as the percent correct classification in an independent sample.

The assessment of whether two or more skeletal elements could correspond to the same individual is a relevant problem in a variety of forensic scenarios. Determining the number of victims contained in a feature, sorting commingled remains in mass graves or mass disasters, or simply assessing whether different sets of dismembered remains belong to the same victim, all require the matching of articulating or paired skeletal elements. Such assessments have traditionally relied on visual examination, based on the experience and expertise of the forensic or

physical anthropologist. However, in the last decades, the availability of new comparative samples, and the quantitative requirements imposed by the *Daubert* standards, have resulted in the proposal of novel quantitative methods to approach this problem. Among them, Byrd (2008) contributes the most comprehensive approach both to discuss and systematize the conceptual problems attached to the different scenarios usually confronted in forensic settings, and to propose novel quantitative methods specific to each scenario.

This study examines the simplest of these scenarios: "the comparison of left and right bones using models that key on shape" (Byrd, 2008, p. 200.) To confront this problem, Byrd (2008, pp. 201-204) proposes a model based on a parameter "D" (*Byrd's D*, herein), calculated from the pooled linear differences in a set of variables of the two skeletal elements under study. Among other postulates, the model assumes a Student *t* distribution for this parameter, and recommends a diagnosis based on the 90% confidence interval for this distribution.

The present study tests the distribution of Byrd's D, as well as its percentage of correct classification using the same variables and parameters described by this author (Byrd, 2008), and based on a sample of 81 male individuals from the Todd Collection. A sample of 236 male individuals from the Forensic Data Bank (1) are also employed to assess the performance of Byrd's D when standard measurements (sensu Buikstra and Ubelaker, 1994) are employed. An alternative method based on Euclidean distances from Principal Component Analysis is proposed; and the effect of the number of variables and victims on both estimates is tested.

Results suggest that, as assumed in the original model, the distribution of Byrd's D neither departs from normality nor shows a mean significantly different from zero. The equivalence of the 90% confidence interval proposed by Byrd (2008) with a 0.05 alpha-level in a one-tailed conventional hypothesis test is also shown. However, the distributional parameters obtained by Byrd (2008) do not represent the best fit, which would render a negative mean and a larger standard deviation. As a consequence, the method results in a percentage of misclassification much higher than predicted by the model. It is therefore suggested that the larger standard deviation values should be used when applying Byrd's method.

Finally, the accuracy of the assessment is shown to depend heavily on the number of victims considered, so that simply selecting the skeletal element showing the smaller Euclidean distance in the phenotypic space renders percentages of correct classification above 90%, and superior to those attained by Byrd's method, when two to four individuals are considered, and the true pair is present in the sample.

Osteometric Sorting, Commingled Remains, Paired Elements

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