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A TEST OF THE PERFORMANCE OF THREE AGE INDICATORS OF THE ADULT
HUMAN PELVIS AND THE INFLUENCE OF OCCUPATION ON MORPHOLOGY

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Abstract

The adult human pelvis is useful to estimate age because it contains three age indicators—the pubic symphysis, auricular surface, and acetabulum. Few studies test the relative performance (accuracy, inaccuracy, and bias) or address whether there are trends in physical activity's influence the morphology of these age indicators. To this end, I addressed three questions: 1) How do the pelvic aging methods perform in terms of accuracy, inaccuracy, and bias in predicting age? 2) Does a summary age of the methods produce a closer estimate to the known age of an individual? And 3) Does occupation (classified as manual or non-manual labor) influence the age estimate produced by any of the pelvic indicators? Occupation was used as an approximation of physical activity.

I tested four different pelvic aging methods: the Suchey-Brooks (1990) pubic symphysis, Osborne et al. (2004) auricular surface, and Rissech et al. (2006) and Calce (2012) acetabulum methods. White male and female individuals (N = 212), with documented occupation and known age from the W.H. Bass Donated Skeletal Collection, University of Tennessee, Knoxville, were used to test the performance of these methods. After, I estimated the indicator's age I combined them into a summary age.

The Rissech method performed the best, was most accurate method with the smallest inaccuracy and bias, followed by the Osborne, Suchey-Brooks, summary age, and then Calce methods. Despite not having the best performance, only the Suchey-Brooks age estimates correlated significantly with known age. The Suchey-Brooks method had the largest reference population used to generate its regression statistics (N=1225), which suggests a large sample size may be crucial to determining age estimates that are significantly close to the known age of an individual. Alternatively, it may be that Suchey-Brooks study sample coincidentally reflected the age distribution of the reference sample used in this study sample and the significant correlation is misleading. Summary age did not perform better, which may be due to it being average of the four method's age estimates combined. The Rissech method had the best performance, which may indicate that Bayesian prediction may improve age estimation and should be applied to other age indicators.

Occupation did not influence the age estimates except in four cases—Suchey-Brooks and Calce's estimates for the whole sample and Osborne and Rissech's female estimates. Non-manual occupations were overaged compared to manual. The significant relationship for female estimates may be the consequence of small sample size (n = 76) of females classified as manual laborers. The implications of the overestimation of age should not be dismissed entirely though. It is possible inactivity (non-manual occupations) increases bone degeneration ("older" appearance) in pelvic age indicators.

Further occupation studies will clarify whether a relationship between occupation and age estimation exists. These studies should be expanded to other age indicators.