A3   Assessing the Utility of the Suchey-Brooks Method on a Historical Sample

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Learning Overview: The goal of this presentation is to compare the accuracy, inaccuracy, and bias observed between the McKern and Stewart and Suchey-Brooks methods of pubic symphyseal aging.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by directly comparing various methods developed on historical and modern samples to assess the utility of each method in a forensic context, as well as by comparing the accuracy between a component-based and a phase-based system of age estimation.

In forensic anthropology, the last two decades have seen an increased focus on the development of population-specific methods to account for variation inherent in modern human groups. Given that it is best practice to use aging methods developed on a contemporaneous sample, forensic anthropologists use methods developed on either modern or historical reference samples, depending on when the individual died. For example, Defense POW/MIA Accounting Agency Laboratory analysts typically employ the McKern and Stewart (MS) component scoring method for WWII or Korean War (i.e., historical) cases, and the Suchey-Brooks (SB) phase-based method for Vietnam War cases or more recent casework. However, because of taphonomic changes to bone, the MS method, which requires assessment of three areas of the pubic symphysis, may not be applicable if damage is present on at least one of the components. This presentation examines the applicability of the SB method on WWII era individuals to determine whether it can be used in place of the MS method, by comparing the accuracy, inaccuracy, and bias between the methods.

The study sample consists of 33 left and right os coxae of 22 identified WWII-era United States service members from the USS *Oklahoma* loss at Pearl Harbor on December 7, 1941. Individuals are males aged 19-43 years at death. Eight observers with varying levels of experience independently scored each pubic symphysis in the blind using both methods (observations *n*=160). Each observer had access to publications and plastic casts for both methods. Accuracy was assessed using correct classification rates for several estimated age intervals of both methods: SB 1 Standard Deviation (SD) from the mean, SB using 95% prediction interval, MS 1SD and 2SD from the mean, and the MS observed range (the total range of ages in which a composite score was observed in the sample). Observer inaccuracy and bias using the mean age were calculated to quantify the amount and direction of error, respectively.

The estimated age interval using the SB 95% prediction interval was the most accurate (90% correct classification); this is unsurprising, given the large size of these intervals. The accuracy of MS observed range is comparable to SB using 1SD (82% and 83% correct classification, respectively). Correct classification of MS using 2SD is 79%, while MS using 1SD is 56%. However, the SB method has a substantially higher SD compared to the MS method. Overall, correct classification rates indicate that if the pubic symphysis is damaged, precluding the use of MS, analysts can use SB with a similar level of accuracy, though the estimated age interval will be large.

Patterns of observer bias are consistent with previous evaluations of forensic casework.[3] Bias for MS indicates slight under-aging (-1.1 years), while bias for SB indicates over-aging (4.3 years). Examination of bias for each MS component or composite score shows no obvious pattern. However, for the SB method, bias generally increases with each subsequent phase (Phase 1=-1.5 years, Phase 6=27.7 years), which is an artifact of the age intervals increasing size with each subsequent phase. Within this study, overall inaccuracy is slightly higher than previously reported at 4.0 years and 6.3 years for MS and SB, respectively.[3] When examining inaccuracy of each component score or phase, there is a general trend of increasing inaccuracy for both methods as the scores or phases progress, though this is more reflective of decreasing precision (i.e., larger age intervals at older ages) rather than an increasing inaccuracy of the scores or phases.

Results presented here demonstrate that despite temporal differences of the samples, these methods can be used with similar levels of accuracy. This suggests that if casework involving historical era individuals is missing one or more components required for the MS method, the SB phase method can be used if enough of the pubic symphyseal face can be assessed.

Reference(s):
1.   McKern T.W., Stewart T.D. (1957) Skeletal age changes in young American males. Analysed from the standpoint of age identification. *Technical report EP-45*. Natick, MA: Quartermaster Research and Development Command.
2.   Brooks S., Suchey J.M. (1990) Skeletal age determination based on the os pubis: A comparison of the Acsadi-Nemeskeri and Suchey-Brooks methods. *Hum Evol.* 5:227-238.
3.   Brown, C.A. (2009) Uncertainty in skeletal aging: A retrospective study and test of skeletal aging methods at the Joint POW/MIA Accounting Command Central Identification Laboratory. Unpublished Master's Thesis, Department of Anthropology, California State University, Chico.

Age Estimation, Pubic Symphysis, Biological Profile