H8 Validation of the Kindschuh et al. (2010) Method for Determining Sex from the Hyoid Body

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After attending this presentation, attendees will understand: (1) the sex estimation method presented by Kindschuh et al.; (2) the significance of analyzing comparable datasets for metric studies; and, (3) the importance of utilizing modern skeletal collections for forensic studies.

This presentation will impact the forensic science community by illustrating the importance of utilizing comparable datasets for metric studies of sex determination. In addition, this study demonstrates that the accuracy of the Kindschuh et al. method may be difficult to judge when subtle differences in data collection are utilized.[1]

The hyoid bone is widely used in forensic contexts as an indicator of neck trauma; however, other studies such as the work of Kindschuh et al. have suggested that the hyoid bone can be used to estimate sex.[1] In their study, 398 hyoid bones were utilized from the Terry Collection to generate six discriminant function equations with classification accuracies that ranged from 82% to 85%.

Two of the equations developed by Kindschuh et al. exclusively utilized unfused hyoid bodies to estimate sex and the current study was designed to test the accuracy of those discriminant functions.[1] This study made use of original data collected by Devlin on a large sample of unfused hyoid bodies drawn from the William F. McCormick Collection (n=1,033).[2] Both males and females of European and African ancestry were utilized and age-at-death of the sample ranged from 20-79 years. Two measurements of the hyoid body were employed: body height and body length. In both studies, Kindschuh et al. and Devlin define these measurements identically; therefore, data from the McCormick Collection were applied to the Kindschuh et al. formula.[1,2]

While the original study performed with a rate of 82% accuracy, a rate of only 40% was achieved here and in the majority of cases, males were classified as females. This discrepancy is explained by decreased means for both body length and body height between populations. For example, in the Terry European-American sample, mean body length was 25.11mm for males and 21.04mm for females while in the McCormick European-American sample, mean lengths were 20.89mm and 17.67mm, respectively. Mean body heights follow a similar decrease in size between samples. For example, mean body height for Terry European-American males was 12.25mm and 10.46 mmfor females, while in the McCormick sample mean heights were 11.04mm and 9.20mm, respectively. Overall, mean body length decreased by 17.01% in males and 16.01% in females and mean body height decreased by 9.88% in males and 12.04% in females.

While metric differences between the Terry Collection and contemporary samples like the McCormick Collection have been attributed to secular change in other studies, it is possible that the discrepancy observed here is due to variation in measurement technique.[3,4] Recent contributions have documented the importance of demonstrating low inter-observer error when multiple datasets are compared, though no studies have systematically compared techniques utilized for measuring the hyoid bone.[5,6] Additional data collection and direct comparison between the Terry and McCormick samples are necessary to elucidate a clear pattern.

References:

1. Kindschuh SC, Dupras TL, Cowgill LW. Determination of Sex from the Hyoid Bone. Am J Phys Anthropol 2010;143:279-284.
2. Devlin JL. Morphological considerations of the human hyoid bone [dissertation]. Knoxville (TN): Univ. of Tennessee, 2002.
3. Jantz RL, Meadows Jantz L. Secular Change in Craniofacial Morphology. Am J Hum Biol 2000;12:327-338.
4. Martin DC, Danforth ME. An Analysis of Secular Change in the Human Mandible over the Last Century. Am J Hum Biol 2009;21:704-706.
5. Jantz RL, Hunt DR, Meadows L. The Measure and Mismeasure of the Tibia – Implications for Stature Estimation. J Forensic Sci; 40: 758-761.
6. Adams BJ, Byrd JE. Interobserver Variation of Selected Postcranial Skeletal Measurements. J Forensic Sci 2002;47: 1193-1202

Sex Estimation, Hyoid Body, Metric Measurement Techniques

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