A24 Testing the Performance of a New Age-Estimation Method on an Asian Sample

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After attending this presentation, attendees will be well versed in pubic symphyseal morphologies commonly used in age-estimation techniques.

This presentation will impact the forensic science community by providing the results of a validation study of a new component-based method that uses developmental and degenerative traits of the pubic symphysis to estimate age in individuals less than 40 years of age.

Age estimation is a crucial yet challenging task that forensic anthropologists face during the development of a biological profile. Previous methods used to analyze the pubic symphysis for indicators of age involved a higher probability of misclassification due to the overlapping physical features and broad age ranges. Additionally, previous methods have primarily used samples from American White individuals, often from samples that date to the 20th or even 19th centuries.[1-3] Validation studies of statistical models built using American White populations have shown reduced accuracy when tested on populations outside of the reference sample.[4] Practitioners at the national and international level work with skeletal samples from a large number of ancestral categories and often find that established methods for estimating the biological profile perform differently on different geographic and temporal populations. Therefore, it is necessary to assess the performance of methods on populations outside the reference sample used in initial model building. Forensic anthropologists ultimately require a methodology that is applicable to a range of ethnicities for assessing age and the first step in reaching this lofty goal is to ascertain how a method performs on samples that were not used to construct the method.

To examine the accuracy and precision of the Dudzik and Langley method, this study tested the performance on modern Asian samples collected for this study.[5] The original method was produced using forensically relevant modern American samples of known age, sex, and ancestry from the Maricopa County Forensic Science Center in Phoenix, AZ, as well as donated individuals from the William M. Bass Forensic and Donated Collections at the University of Tennessee, Knoxville. Specifically, this method assessed the accuracy of distinct morphological features of the pubic symphysis in young adults that are typically observed in ages less than forty. Five indicators were used in the decision tree to estimate the age category of each individual. The five features included the pubic tubercle epiphysis, symphyseal billowing, presence of the ossific nodule at the superior apex, presence of the dorsal plateau, and presence of the ventral rampart.

The Asian samples included Chinese individuals from Kunming Medical University (n=85), Japanese from Jikei University and Chiba University (n=50), and Thai individuals from Khon Kaen University and Chiang Mai University (n=50). Testing the method on the Chinese sample produced 72% accuracy, which is lower than the reported results using American White and Black individuals, which delivered correct percentages not lower than 83%. Accuracy rates for the pooled Asian samples were not as high as the percentages identified in the American samples reported previously and were generally less than 80%.

This study reveals the results of an age estimation method that uses a decision tree approach for component-based traits of the pubic symphysis. This analysis confirms the need for population-specific methodologies for not only age estimation but all aspects of the biological profile. Further research involving samples that span larger coverage of world populations is necessary for forensic anthropologists that practice in the ever-globalizing population of the United States. Method validation using larger sample sizes will help to reveal what aspects of the decision tree method produces the highest percentages of accuracy and identify which age categories experience the most variation across different ancestral groups. Future work in this arena will allow for modifications of existing age estimation techniques to better serve forensic anthropologists who work closely with a varied number of ancestral groups.

Reference(s):

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Age Estimation, Pubic Symphysis, Validation