A18 An Evaluation of Patellar Measurements for Estimating Sex in African Americans

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Learning Overview: After attending this presentation, attendees will better understand the accuracy of discriminant functions derived from patellar measurements for estimating the sex of African Americans as well as better understand the implications of these functions on the biological profile while attempting to identify unknown individuals.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing a comprehensive evaluation of patellar measurements for estimating the sex of African Americans and will identify the most accurate methods for forensic anthropologists to use for estimating sex from patellar measurements.

Sex estimation is an important aspect of the biological profile used to identify unknown human skeletal remains. Determining sex can exclude nearly half of individuals in missing person databases, and it can help with estimating other aspects of the biological profile such as ancestry and stature. Sex is most accurately estimated using a complete skeleton; however, forensic anthropologists do not often work with complete skeletons, but rather partial skeletons or even fragments of skeletal remains. In the absence of the skull and pelvis, forensic anthropologists must rely on methods that do not use either of these elements for estimating sex. It is therefore useful to develop methods that can estimate sex based on skeletal elements other than the skull or pelvis.

Generally, there are two types of methods for estimating sex: non-metric methods that rely on observation of the skeleton, and metric methods that rely on measurements of the skeleton. One of the most commonly used metric methods for sex estimation is Discriminant Function Analysis (DFA), which has been applied to many bones for estimating sex, including the vertebrae, sternum, upper limb bones, pelvis, and lower limb bones, among others. One of the major limitations of DFA is that it is population specific, meaning functions derived from one population may not be accurate when applied to another population. Another limitation of DFA is that although many methods have been derived from various bones of various populations, not much research has examined the reliability of these methods.

Therefore, the goal of this current research was to evaluate the reliability of a recent method developed by Peckmann and Fisher for estimating the sex of African Americans using patellar measurements.[1] Peckmann and Fisher derived discriminant functions from the patellar measurements of 200 African American individuals (100 females and 100 males) from the Robert J. Terry Anatomical Skeleton Collection at the Smithsonian Institute's National Museum of Natural History.[1] For the current study, 200 African American individuals (100 females and 100 males) from the Hamann-Todd Osteological Collection at the Cleveland Museum of Natural History were studied. Following Peckmann and Fisher, six measurements were taken of each individual's left patella, including the patella's maximum height, maximum breadth, maximum thickness, height of articular facet, lateral articular facet breadth, and medial articular facet breadth.[1] These measurements were then entered into the discriminant functions developed by Peckmann and Fisher and the overall accuracy rates of these functions for sex classification were recorded and compared to those obtained by Peckmann and Fisher.[1] The overall accuracy of sex classification obtained from the current study ranged from 75.0% to 83.5% for the direct method and 75.0% to 81.0% for the stepwise method. These values are compared with accuracy rates of 80.0% to 85.0% for the direct method and 80.0% to 84.5% for the stepwise method as obtained by Peckmann and Fisher.[1] In the current study, the most accurate functions contained all the variables, whereas the least accurate functions contained only two variables, the maximum height and the height of the articular facet, consistent with the findings of Peckmann and Fisher.[1]

These findings suggest the discriminant functions developed by Peckmann and Fisher from patellar measurements can be used with caution for estimating sex in African Americans.[1] However, the patella should only be used for sex estimation when other bones that are more accurate for estimating sex, such as the bones of the skull or pelvis, are unavailable.

Reference(s):

[1.] Peckmann T.R., Fisher, B. Sex Estimation from the Patella in an African American Population. *J. Forensic Leg. Med*. 2018; 54:1-7.

Sex Estimation, Patella, African American

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