## A6        Sex Determination Using the Distal Articular Surface of the Fibula

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The goal of this presentation is to demonstrate the use of the distal fibula to sex human skeletal remains.

This presentation will impact the forensic science community by offering a new method for determining the sex of human skeletal remains.

In forensic and anthropological literature, the fibula has not been extensively explored for its potential to determine sex. A study conducted by Sacragi and Ikeda used a population-specific discriminant function to correctly classify Japanese males at 90.1% and Japanese females at 91.4%.[1]  This study investigates the distal fibula for its potential to sex Caucasian American skeletal remains. A population-specific discriminant function was developed using a Caucasian sample from the William M. Bass Donated Skeletal Collection. This formula correctly classified 85.2% of females and 89% of males using the left distal fibulae. Intra-observer analysis indicated a percentage error of 1.3%. While age had a slight effect on the measurements, it did not produce a significant effect to inhibit sex determination.

This study included both right and left fibula to determine which side yielded greater accuracy. A total of five measurements were taken of the distal articular surface of the fibula; three perpendicular aspects that form the malleolar surface (PA, PB, PC), total length of the lateral malleolus (LLM), and width of the malleolar fossa (LMF). These measurements combined to produce the discriminant functions that follow. The function for the left fibula is $DF = -14.953 + 0.242(LMF) + 0.253(PA) + 0.169(PC) + -0.055(PB) + 0.214(LLM)$. Scores above 1.0765 are determined male, below -0.8435 are determined female, and scores in between are indeterminate. The function for the right fibula is $DF = -15.128 + 0.253(LMF) + 0.331(PA) + 0.141(PC) + -0.081(PB) + 0.200(LLM)$. Scores above 1.0805 are determined male, below -0.8395 are determined female, and scores in between are indeterminate.

While significant age-related changes were not visible on the distal articular surface of the fibula, regression analysis did indicate that age had some influence on the fibular measurements. The analysis of a younger age bracket and an older age bracket demonstrated that the left fibulae had a smaller percentage of measurements affected by age. Examination of the literature demonstrated that few age-related skeletal changes occur on the articular surface on the distal fibula. This is due to thin articular cartilage and uniformity of cartilage matrix in the ankle, both of which contribute to a rarity of osteoarthritis in the area.

It is believed through this study that the method developed here should be used if the distal fibula is found, with preference given to the left fibulae. The discriminant formula should be used if the remains are suspected to be those of a Caucasian individual. While age does have some effect on the measurements, this technique is not age-dependent and can be used on suspected younger and older individuals. Additionally, low intra-observer error indicates the ease at which this technique can be performed.

**Reference:**

1.    Sacragi, A., Ikeda, T. 1995 Sex Identification from the Distal Fibula. *International Journal of Osteoarchaeology* 5:139-143

**Sex Determination, Anthropology, Discriminant Function**