



## Anthropology Section - 2016

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### A57 The Use of the Sustentaculum Tali in Estimating Sex

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After attending this presentation, attendees will better understand how the Sustentaculum Tali (ST) may be used in estimating sex in decomposed and skeletonized human remains. Attendees will also be introduced to new osteological measurements developed for this study.

This presentation will impact the forensic science community by providing an alternate method for metrically sexing skeletal remains. The sexually dimorphic parameters used in this research will be valuable in conjunction with other sexing techniques.

Sex estimation is a crucial component of the biological profile of unidentified skeletal remains; however, conventional methods of sex estimation are not always feasible when certain sexually dimorphic elements are missing or fragmented. Therefore, it is important to develop additional methods for sex estimation using non-traditional skeletal elements. Forensic practitioners have noted that calcanei are often recovered intact due to their density and protection within shoes and may, therefore, be a viable data source.<sup>1,2</sup> Previous research has also shown the calcaneus to be a sexually dimorphic skeletal element. These studies have considered the calcaneus as a whole but have not focused on dimensions of the ST in particular. Since the ST is a point of articulation between the calcaneus and talus, both sexually dimorphic bones, and existing sexually dimorphic measurements of the calcaneus encompass the ST, it is hypothesized that measurements of the ST will be useful in discriminating male and female calcanei.

The study was comprised of calcanei from 40 individuals, 20 male and 20 female, from the William M. Bass Donated Skeletal Collection at the University of Tennessee, Knoxville. Two researchers independently measured four parameters of the ST: Length (STL), Width (STW), Height (STH), and medial talar Facet length (STF). Measurements in this study were defined and each researcher measured the 40 calcanei three times to assess intra-observer error. A third researcher, uninvolved in developing the measurements, also measured the 40 calcanei to assess inter-observer error and the reliability of the definitions. Discriminant functions were derived using the Statistical Package for the Social Sciences (SPSS) v.21, and an additional sample of 28 calcanei was used to test the accuracy of the functions.

The results show sexual dimorphism for three measurements: STL ( $p=.000$ ), STW ( $p=.050$ ), and STF ( $p=.000$ ). There was no significant difference between males and females for STH. Univariate discriminant analyses were run for the three sexually dimorphic dimensions, resulting in accuracies ranging from 60.0% to 77.5%. Direct discriminant function analyses were run using various combinations of the four variables, correctly classifying 72.5% to 75.0% of the sample. The test sample was classified using the discriminant functions derived from the original sample. The univariate functions accurately sexed 71.4% to 75.0% of the test sample, and the multivariate functions accurately sexed 75.0% to 85.7%.

The results of this study support the hypothesis that dimensions of the ST are useful for sex estimation. The measurements STL and STF had accuracies comparable to previous studies using the calcaneus. The results of this study are particularly important in cases where fragmented calcanei prevent the use of other measurements.

#### Reference(s):

1. Bidmos M.A., Asala S.A. Discriminant function sexing of the calcaneus of South African whites. *J Forensic Sci* 2003;48(6):1213–18.
2. DiMichele D.L., Spradley M.K. Sex estimation in a modern American osteological sample using a discriminant function analysis from the calcaneus. *Forensic Sci Int* 2012;221:152.e1–152.e5.

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#### Forensic Anthropology, Sex Estimation, Calcaneus