



## Physical Anthropology Section – 2005

### H66 Sexing the Zygomatic Bone

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Attendees will learn the zygomatic bone is sexually dimorphic and has a potential to be used when addressing questions of sex, especially when using the skull in creating a biological profile.

This presentation will impact the forensic community and/or humanity by demonstrating the sexual dimorphism of the zygomatic bone and its applicability to sex estimations through traditional cranial measurement and geometric morphometric approaches.

The goal of this presentation is to demonstrate sexual dimorphism in the zygomatic bone and its potential for metric sex estimations through the use of a Microscribe 3-DX Digitizer.

This poster will demonstrate the potential of the zygomatic bone for sex estimation. The attribution of sex is an important component of the biological profile, and relies on the sexually dimorphic characteristics of the human skeleton for its assessment. Sexing involving the skull relies on non-metric traits, such as mastoid size, and/or comprehensive cranial measurements. Investigating individual components of the skull, such as the zygomatic bone, metrically, could strengthen sex estimation using the skull. However, measuring the zygomatic bone is problematic when using a traditional caliber approach, since intra-observer variation in measurements is often the same as the corresponding error. Geometric morphometrics, using coordinate data could eliminate much of this problem.

As early as Woo (1930-31), the need for focusing on the metric assessment of individual elements of the skull was established. Ancestral differences in the zygomatic bone cannot be properly assessed without addressing intra-population sexual dimorphism first. A metric analysis of the zygomatic bone will demonstrate its potential to become a criterion in the suite of characteristics examined when assessing sex, especially when using the cranium.

The zygomatic bone is situated in the superior, lateral aspect of the face comprising the cheek, lateral wall of the orbit, and the infratemporal fossa (Gray 1973). It has three surfaces: the lateral, which bears the malar tubercle, the temporal for attachment of the temporalis muscle, and the orbital, which bears the eminentia orbitalis for attachment of the check ligaments (Gray 1973, Whitnall 1911). Three processes: the maxillary, frontal, and temporal with corresponding borders are discernable. On the posterior-superior border, a tuberosity, called the tuberculum marginale or marginal process, is located for attachment of temporal fascia (Oxnard and Wealthall 2003). This process tends to be more strongly developed in males (WEA 1980). The marginal process appears early in childhood development, between the second and third years, whereas the malar tubercle and masseteric attachment do not form until puberty (Scheuer and Black 2002). This marginal process, the height and width of the zygomatic bone will be assessed for significant sex differences.

Coordinate data were collected from a random sample of 60 males and 60 females of European ancestry using a mechanical arm Microscribe3-DX digitizer. 14 landmark data points were taken to provide an accurate depiction of the bone. A centroid point was established and was the basis for calculating three measurements: the height, width, and projection of the marginal process. These measurements were evaluated using the SPSS statistical software package for significance at a  $p < 0.05$ . When analyzed separately, the mean and standard deviation of the height, width, and marginal process projection suggest the zygomatic bone displays sexually dimorphic features. However, in a multivariate analysis, the height and width were the only measurements significant at the  $p < 0.05$  level suggesting that the sexual dimorphism seen in the marginal process is eliminated when size is controlled-for.

This research indicates the zygomatic bone is sexually dimorphic within a European population. Further research addressing shape characteristics and inter-population variation needs to be completed before the utilization of the zygomatic bone in sex estimation. While there are implications for its use in sexing, further investigations must be conducted to verify its utility, especially in accurately determining sex.

**Forensic Anthropology, Zygomatic Bone, Sex Estimation**