

ABSTRACTS

Detangling pubis bone traits in sex estimation: The utility of pubis morphology prior to ventral arc expression

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The ventral arc (VA) is commonly used in adult sex estimation. However, this trait develops secondary to pubis elongation during which increased estrogen levels in pubertal females displace the adductors to the ventral surface of the pubis, resulting in VA formation. Although this process occurs during puberty, the VA may not fully develop until after 20 years of age. Since pubis elongation occurs prior to VA formation, pubis morphology (PM) may assist in estimating sex in lieu of a VA. The goals of this research were to: 1) determine the age at which the VA is consistently expressed, and 2) determine when PM becomes dimorphic. Data was queried from the Subadult Virtual Anthropology Database: A sample of 226 females and 210 males were used to score PM using a 5-point ordinal scale. VA was also scored for females as present/absent. No female expressed a VA until 14 years (61.5%) and rates of VA per annual age group never exceeded 70% except for 19- and 20-year-olds (78.4% and 71.4%, respectively). A PM score of 3 was found to separate the sexes ($p \leq 0.01$). For females, a score of 3 was first expressed by age 9 (20%) and scores ≤ 3 were expressed at rates exceeding 86.7% for all females older than 14 years. In contrast, not one male exhibited a PM < 3 . Results indicate the VA should not be used prior to 20 years, while PM can be accurately applied as early as 14 years.

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Trabecular bone microarchitecture of the radial and femoral distal metaphyses during the period of locomotor behavior development

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Trabecular bone microarchitecture (TBMA) responds to changes in loading, as experienced during locomotion. Although TBMA is particularly useful in the study of primate locomotor behavior, structural changes related to the development of human locomotion are not fully understood.

The goal of this study is to characterize changes in TBMA in upper and lower limbs in a sample of juvenile humans. We selected 26 children from the Certosa identified skeletons collection (Bologna University, 0-38 months old) without signs of bone pathology. The distal radial ($n=20$) and femoral ($n=25$) metaphyses were μ CT-scanned (9-18 μ m) and the bone volume fraction (BV/TV), degree of anisotropy (DA), and trabecular thickness (Tb.Th) were quantified in Medtool 4.4 and mapped using Phenotypic Point Cloud Analysis.

Variation in TBMA parameters was observed for both radial (BV/TV) and femoral (BV/TV, DA, Tb.Th) metaphyses. With advancing age, the radius showed, first, a homogenous distribution of BV/TV; then, a more concentric pattern with higher values medially; and finally, a gradient of moderate values, higher posteriorly. Simultaneously in the femur, Tb.Th and BV/TV showed no differences between medial and lateral sides and the TBMA was more isotropic at the periphery. Then, BV/TV, Tb.Th and DA showed differences between lateral and medial sides. Finally, lateral and medial sides presented similar BV/TV and Tb.Th, and the bone is more isotropic at the midline.

These patterns of TBMA variation may relate to the acquisition and maturation of bipedal walking and the associated changes in loading as children transition through stages including pre-locomotion, crawling, and bipedalism.

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Differences in morphological integration of the hominoid postcranium due to landmarking protocol

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Previous research has shown that landmarking methods can have distinct effects on results of the calculation of integration, possibly depending on the skeletal element of focus. Here, we expand on this research by comparing integration results for multiple taxa and skeletal elements, each landmarked in two different ways. Anatomical and semilandmark data were collected from 3D surface scans of the os coxa, femur, tibia, fibula, scapula, humerus, radius, and ulna of four hominoid and two cercopithecoid taxa. The anatomical

and semilandmarking protocols were designed to characterize similar regions of each bone to best facilitate comparison. Integration was calculated using the Integration Coefficient of Variation (ICV) using interlandmark distances and distributions of values generated using a resampling protocol. Comparison of ICV results between landmarking protocols was performed via Mann-Whitney U tests with Bonferroni correction.

Overall, elements characterized with semilandmarks led to significantly higher ICV values than the anatomical protocols. Crucially, the among taxa pattern of magnitudes was largely conserved even when semilandmarks were introduced. However, among skeletal elements, introduction of semilandmarks was disruptive to the pattern of magnitudes. While the two landmarking protocols generated significantly different results for all skeletal elements, the difference between the two protocols was less pronounced for the girdle elements when compared to the long bones. Likewise, the difference between anatomical and semilandmark protocols was, on average, lower for less integrated taxa. Further research will be necessary using other statistics and methods to determine the extent to which this pattern hold true in integration studies more generally.

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Urban-rural homogeneity in morbidity and mortality throughout the life course in the southeastern United States.

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The urban northeastern and mid-Atlantic U.S. in the 18th and 19th centuries often is characterized by poor childhood health due to high population density, poor sanitary conditions, and high levels of pollution, in addition to extractive childhood labor practices. While bioarchaeological investigations have identified the poor nutrition and high activity levels of enslaved populations in the Southeast, the impact of urban environments in this predominantly agricultural, non-industrialized region remains relatively understudied. This investigation focuses on how early childhood environments impacted morbidity and mortality of one family from the urban southeastern U.S. from the 1850s through the 1970s. Evidence for early life stress in the form of growth disruption and skeletal and dental lesions associated with disease and malnutrition were documented in a minimum of 29 individuals from the Rhem family vault, located in New Bern, North Carolina. These variables were compared to two contemporary samples from land-owning families in rural eastern North Carolina to identify rural and urban