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## Alternative osteometric approaches for sex and stature estimation using fragmentary femoral elements

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### Abstract

**Background:** In forensic contexts, human remains are frequently recovered in a fragmentary state due to taphonomic processes, trauma, disasters, or deliberate body disposal [1,2]. Under such circumstances, traditional anthropological methods that rely on complete skeletal elements can't always be applied [3]. Thus, the development of alternative approaches capable of estimating the biological profile from incomplete skeletal elements is of considerable importance in forensic anthropology. **Objective:** This study aims to evaluate the potential of several femoral measurements to estimate sex and stature when only partial femoral elements are available. **Methods:** A sample of femora with known biological profiles was analyzed using osteometric measurements of the proximal femur and diaphysis. Variables included midshaft perimeter (PM), vertical diameter of the femoral head (DVC), transverse diameter of the femoral head (DTC), femoral neck length (FNAL), and femoral neck width (FNW). Sex differences were evaluated using descriptive statistics and t-tests. The relationship between these variables and stature was assessed through Pearson correlation. **Results:** All measurements showed higher mean values in males, reflecting sexual dimorphism. A statistically significant difference between sexes was observed for the midshaft perimeter (PM), indicating greater diaphyseal robustness in males. Stature estimates ranged from 146.9 to 171.5 cm (mean = 157.5 cm). Among the variables analyzed, the vertical diameter of the femoral head (DVC) demonstrated the strongest correlation with stature ( $r = 0.92$ ), followed by the transverse diameter (DTC;  $r = 0.87$ ) and femoral neck length (FNAL;  $r = 0.84$ ). These results indicate that proximal femoral dimensions may provide reliable proxies for stature estimation when femoral length is unavailable. **Conclusions:** The findings suggest that femoral head and neck measurements can contribute significantly to sex and stature estimation in fragmentary skeletal remains. Such alternative osteometric approaches may improve the reconstruction of the biological profile in forensic cases where complete long bones are not preserved.

**Keywords:** forensic anthropology; biological profile; fragmentary remains.

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### References

1. Dirkmaat, D.C. et al. Forensic Archaeology and Forensic Taphonomy: Basic Considerations on how to Properly Process and Interpret the Outdoor Forensic Scene. *Acad Forensic Pathol* **2016**, *6*, 439-450, doi: 10.23907/2016.045.
2. Dirkmaat D.C. et al. New perspectives in forensic anthropology. *Am J Phys Anthropol* **2008**, *Suppl 47*, 33-52, doi:10.1002/ajpa.20948.
3. Garvin, H.M. et al. Forensic Tools for Species Identification of Skeletal Remains: Metrics, Statistics, and OsteoID. *Biology (Basel)* **2021**, *11*, 25, doi: 10.3390/biology11010025.



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