



## A60 Stature Estimation Using the Mandible in a Caucasian Italian Population

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After attending this presentation, attendees will have additional analytical tools for assessing unknown human remains. A new method for estimating stature using the mandible will be introduced, particularly useful where few diagnostic skeletal elements are present.

This presentation will impact the forensic science community by providing a new method to contribute to the biological profile using a skeletal element not typically used for this purpose. When unknown human skeletal remains are recovered, anthropologists estimate the biological profile (age, sex, ancestry, stature, etc.) using all available analytical tools. In this way, it is possible to reduce the list of potential missing persons matches and to help achieve a positive identification.

In forensic anthropology, stature estimation is an important parameter used in personal identification where the most common methods involve analysis of the full skeleton or long bones.<sup>1,2</sup> If long bones are absent, the only remains available may be ones not normally used to estimate stature. The mandible is potentially valuable in connection with stature estimation, but has been little studied, despite its successful use in estimating sex and, in some cases, age. Since stature is population-specific, a mandible-based method should derive from study of a population biologically similar to the remains being analyzed.<sup>3</sup> A stature method based on the mandible in a Caucasian Italian population is still not present in the current literature.

The current study investigated the relationship between the mandible and the stature of individuals from a Caucasian Italian population in order to develop a formula for the estimation of stature from this bone. The sample included 103 living Caucasian individuals from Italy (62 males and 41 females) with a mean age of 41.4 years. The variables of interest include four mandibular parameters (total condylar width (CoCo), total gonial width (GoGo), Condylar-Gonion (CoGo), and Gonion-Gnation (GoGn)) as well as measured stature (cm), age of the individual, and ancestral information (to confirm ancestry).

Using the data collected, Mean Stature (Hcm) was modeled using linear regression models. In the literature, previous models establish the relationship of Hcm with sex and age (e.g., it is known that stature decreases with age).<sup>4</sup> Therefore, these two variables (sex and age) were included in the linear regression models in addition to the measurements of the mandibular parameters using two different approaches:

**Model A** - Including a parameter called "Outline":  $2*(CoGo+GoGn)$ .

**Model B** - Including all the singular parameters (CoCo, GoGo, CoGo, and GoGn) and reducing their number on the way by means of a backward selection. The final model included only parameters with a P value less than 0.10.

In both models (A and B), sex and age were strongly associated ( $p < 0.01$ ) with stature, confirming Hcm is significantly higher in male and decreases with age. In Model A, this study found that Hcm was positively associated with the "Outline" ( $p < 0.001$ ) resulting in a total model  $R^2$  (coefficient of determination) of 0.657. Model B, after the backward selection, included as mandibular parameters CoGo ( $p = 0.091$ ) and GoGn ( $p < 0.001$ ), resulting in an  $R^2$  of 0.665 for the final model.

In conclusion, based on  $R^2$  value, the mandible appears to be potentially useful for stature estimation. In the current literature, similar  $R^2$  value has been considered reliable when long bones are not available.<sup>5</sup>

The next stage of this study should be to validate these models using new mandibular and long bone measurements for Caucasian Italians. This method could be applied to improve personal identification of incomplete human remains in order to evaluate a range of stature for filtering the list of missing persons in a Caucasian Italian population.



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## References:

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## Stature, Mandible, Identification