OPEN ACCESS Scientific Letters

IV 1H-TOXRUN INTERNATIONAL CONGRESS 2025 | 08-09 MAY, 2025 Porto, Portugal

Poster 23

Forensic Anthropology: assessing reliability and sources of bias

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Abstract

Background: Forensic anthropology is critical in human identification, mainly in extreme situations (e.g., mass disasters when other methods fail or in criminal cases where the victim's body is in an advanced decomposition state) [1]. Forensic anthropology has legal and medico-legal implications for individuals' identification. The methods used ensure that the conclusions are coherent, reliable and subject to bias, even though a comprehensive study analyzing the reliability and potential biases of the discipline's methods has yet to be conducted [2]. Moreover, additional contextual information influences morphological analysis in forensic anthropology. A study involving 52 experienced osteologists divided into two groups, measured a human femur with or without additional information, and found that human cognitive processes are susceptible to biases and errors. Consequently, metric analyses can be affected, particularly when individuals are exposed to a specific context beforehand [3]. In contexts with commingled remains, metric analysis is an important technique to determine the minimal number of individuals involved and distinguish between different subjects. Therefore, deciding which measures are more robust and provide the most reliable results is of the utmost importance. **Objective:** To determine which measurements are more easily repeated and reproduced in the humerus and the femur. **Methods:** Right and left humeri (20 each) and right and left femurs (20) were measured twice by the same observer (a week apart) and then by a second observer. The measurements performed were in the humerus: a) maximal length (h1); b) minimal diaphysis circumference (h2); c) epicondyle distance (h3); and d) head circumference (h4). In the femur were: a) maximal length (f1); physiological length (f2); maximal diaphysis circumference (f3); and d) head circumference (f4). Samples belonged to the XXI Collection of Identified Skeletons from CESPU. Results were analyzed using the intraclass correlation coefficients (ICCs). **Results:** For inter-observer error, the mean ICC analysis in the humerus was h1- 1, h2-0.882, h3-0.775, and h4-0.775; in the femur was f1-0.789, f2-0.788, f3-1; f4-1. Regarding the intra-observer error analysis, the mean ICC values were 1 for all variables. Altogether, the values of the coefficients indicate excellent reliability and reproducibility. Nevertheless, some bones were severely damaged, making some measurements impossible to collect. The femur was systematically better preserved, and the diaphysis displayed less damage than the epiphysis. **Conclusions:** Although all the selected measures displayed perfect repeatability and excellent reproducibility, it was clear that some bone structures are more prone to being damaged. The development of methodologies to work in reassembling skeletons in a commingled remains context should have this under consideration.

Keywords: Forensic Anthropology; human identification; medico-legal implications

Acknowledgments/Funding

This research received no external funding.

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