

### Throwing Light on the Past. A New Methodology for Analysing Activity-related Skeletal Changes in Humeri

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# Throwing Light on the Past

# A New Methodology for Analysing Activity-related Skeletal Changes in Humeri

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The medial epicondyle of the humerus is a particularly relevant anatomical area to reveal physical activities performed during an individual's lifetime 1-3 (e.g. throwing of objects, the use of axes and stone tool manufacture)4.5 and the sexual division of labour in past human groups. However, the qualitative recording of osseous alterations in this area remains particularly subjective and prevents large-scale comparisons.

The **main** aim of this research is to develop a novel method to record these alterations quantitatively through non-invasive 3D-imaging.



- Prerequisite: 3D model of humerus
- Can be obtained through CT-scanning, 3D surface scanning, or photogrammetry

## Pre-processing of models

- Filter (i.e. simplification, smoothing)

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## **Quantitative Analysis**

## What? Topographical analyses

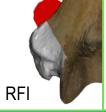
- quantify the whole-surface morphology,
- through complementary variables such as curvature, relief and complexity

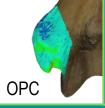
How? molaR package<sup>6</sup> in an R environment

### Which analyses?

- Dirichlet Normal Energy (DNE)(curvature measure that quantifies the degree of surface bending)
- Relief Index (RFI) (relief measure calculated through the ratio of the 3D surface area to the 2D footprint)
- Orientation Patch Count (OPC) (complexity measure that counts the number of similarly oriented regions)









## Conclusions & Prospects

- Complementary shape variables can be applied to quantify osseous alterations of the humeral medial epicondyle.
- Through 3D-imaging, the method offers a non-invasive approach to more **objective** recording of these alterations.
- Application to identified osteological collections will improve understanding of the analyses' results and their interpretation.
- The method can create new insights into physical activity and sexual division of labour in the past.

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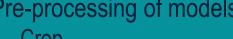








Preparation



- Crop
- Orientate