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directed by  
Jean CLOTTE

PLEISTOCENE ART OF THE WORLD

Short articles



## HANDPRINTS IN PARIETAL ART:

### Interpretive Possibilities and Limits from the Perspective of Forensic Anthropology

Jaroslav BRŮŽEK, Martina LÁZNIČKOVÁ-GALETOVÁ  
Patrik GALETA, Jérémy MAESTRACCI

In parietal art, handprints are sometimes directly attributed to the authors of the representations located near them. Recent attempts to estimate the sex of individuals based on handprints rely on the sexual dimorphism of this body part and its dimensions, and in particular the proportional index between the length of the second and fourth fingers (“digit ratio” or Manning index). The aim of our study is to show, from a forensic perspective, the degree of precision and reliability of sex determination based on this index and hand dimensions.

The sample studied consists of 100 adult subjects from a homogeneous population composed of 50 men and 50 women, all students of the University of Bordeaux 1. The subjects are between 19 and 28 years old and their average height is 1 646 mm for the women and 1 783 mm for the men. We measured six linear dimensions: the length and width of the hand, the length of the fingers from digit 2 to (D2) to digit 5 (D5), according to the definitions by Martin presented in the work of Knussmann, published in 1988. Two indices were calculated from these measures.

Before presenting our results, it is essential to clarify the terminology used. In the forensic domain, the most common technique of classification is discriminant analysis, which leads to the establishment of discriminant functions (DF). We can employ terms such as “precision” (the rate of individuals classed in concordance with the true sex) and the “reliability” of the methods (rate of individuals classed correctly in another population), the common criteria of correct classification (probability limit of 0,5) and the rate of reliable classification (probability limit of 0,5).

To respond to the question of whether it is possible to determine the sex of an individual based on handprints, we tested the reliability of the DF no. 3 proposed by Snow in 2006 in the journal *Antiquity*, which attained a precision of 79%. It correctly classed 73% of the French sample. All of the women except one were correctly determined while half of the men were classed as women. The overlap zone overlapping for the two sexes is thus very large. For this reason, the rate of reliable classification is very low (24%), with only one woman and 21 men out of 100 subjects. To conclude, the DF no. 3 is not reliable and its use is not recommended.

The second DF no. 4 of Snow employs indexes (that of Manning  $D2/D4$  and that of  $D2/D5$ ). The rate of correct classification applies to only 59% of the cases in Snow’s original sample. The application of this function to the French sample was also a complete failure. All of the individuals are situated in the zone of male values. The DF no. 4 is inadequate for an estimation of sex based on handprints. To verify that the failure of discriminant function analysis was not linked to the sexual dimorphism of hands in the French population, we then realized a calculation of



Red hand stencil in the Cosquer Cave  
(photo: J. Clottes).

discriminant functions unique to our sample. The discriminant calculated for the French sample was based on the same variables resulted in a higher rate of classification (89%). The dimensions of the hands, like those of other body parts, are forcibly influenced by the format, which partly masks the effect of the form, as Bruzek and Murail pointed out in their synthesis published in 2006. The discriminant functions of the dimensions of the hand, as well as those of bones, are usually specific to a given population. The variability of the Manning index is enormous. Sexual differences exist in all populations, but the absolute values of the index are variable for each one. This is the main reason that discriminant functions cannot be used for sex determinations.

The human hand shows a significant sexual dimorphism in relation to height. Despite this differential expression, discriminant analysis of the variables of the hand produces a relatively high rate of correct classification (around 80%), but with a very large overlap zone. This reduces the rate of reliable classification and plays a major role in its use for classification. The information obtained from this forensic anthropological analysis shows that sex determinations based on handprints in parietal art are not reliable.





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