



Contents lists available at ScienceDirect

Journal of Archaeological Science

journal homepage: <http://www.elsevier.com/locate/jas>

Beyond size: The potential of a geometric morphometric analysis of shape and form for the assessment of sex in hand stencils in rock art

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ARTICLE INFO

Article history:

Received 30 July 2016

Accepted 2 November 2016

Available online xxx

Keywords:

Palaeolithic

Cave art

Sex assessment

Geometric morphometrics

Biometrics

Forensic anthropology

ABSTRACT

Hand stencils are some of the most enduring images in Upper Palaeolithic rock art sites across the world; the earliest have been dated to over 40 Kya in Sulawesi and 37 Kya in Europe. The analysis of these marks may permit us to know more about who was involved in the making of prehistoric images as well as expanding the literature on the evolution of human behaviour. A number of researchers have previously attempted to identify the sex of the makers of Upper Palaeolithic hand stencils using methods based on hand size and digit length ratios obtained from digital or photo-based images of modern reference samples. Some analyses report that it was males who were responsible for the majority of hand stencils, whilst the most recent analysis determined that females produced the majority of hand stencils. Taken together, however, these studies generate contrasting and incompatible interpretations. In this study we critically review where we currently stand with methods of sexing the makers of hand stencils and the problems for the interpretation of hand markings of Palaeolithic age. We then present the results of a new method of predicting the sex of individuals from their hand stencils using a geometric morphometric approach that detects sexual differences in hand shape and hand form (size and shape). The method has the additional advantage of being able to detect these differences in both complete, as well as partial hand stencils. Finally we urge researchers to test this method on other ethnic groups and populations and consider ways of combining efforts towards a common goal of developing a robust, predictive methodology based on diverse modern samples before it is applied to Upper Palaeolithic hand stencils.

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1. Introduction

Images of the human hand provide us with some of the earliest, most abundant and most enduring images in rock art (Pettitt et al., 2014, 2015; García-Díez et al., 2015). They have been recorded at sites across the Americas, Africa, Arabia, Australia, East and South Asia and Europe (e.g., Aubert et al., 2014; Clottes, 2010; Chazine, 2005). In some cases hand images are pecked into the rock (see Clottes, 2010), but the most common forms require the use of paints to create prints or stencils. Hand prints are made when a hand

coated with paint or pigment is pressed against a surface, leaving a direct image; a stencil occurs when a clean hand is placed directly against a surface and paint or pigment is applied over the top, such that when the hand is removed a negative impression of its presence remains (Pettitt et al., 2015). In contrast to pecked hand images, hand prints and hand stencils necessarily preserve a record of the original size and shape of a real hand and these images, therefore, can be directly related to an/the individual actively involved in the prehistoric image-making process.

Hand images from sites around the world are likely to span many thousands of years in age, with some examples having been produced relatively recently (in Australia, Africa) and others much longer ago (Aubert et al., 2014; Pettitt et al., 2015). Possibly the oldest surviving corpus of images comes from Europe, where most

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are likely to date before 20,000 years ago (Snow, 2013). In Western Europe, there are thirty-eight sites of accepted Palaeolithic age with preserved images of human hands on their walls; nearly 1000 images in total (Groenen, 2011; Snow, 2006). The number varies greatly between sites. Most sites have a small number of images, a few have tens of such images (e.g., El Castillo, Maltraveiso, Rouffignac), and a very few have hundreds of hand images (e.g., Gargas, Chauvet and Cosquer) (Pettitt et al., 2015). In caves with the largest number of hand images, many are partial, with missing digits or digits that are considerably shorter than they must have been in life (Leroi-Gourhan and Michelson, 1986).

There is no accepted explanation for the making of these images in Palaeolithic times. Early ideas have included enjoyment, hunting magic, accidental marking, and some form of visual plea to the heavens (see Ucko and Rosenfeld, 1967), whilst more recently they have been linked to shamanistic practices (Lewis-Williams, 2002; Clottes and Lewis-Williams, 1996) or markings made by adolescent males perhaps during rites of passage (Guthrie, 2005). Images

of partial hands have been interpreted as evidence of disease or mutilation (Janssens, 1957, though see Hooper, 1980; Wildgoose et al., 1982 for a re-assessment) or as forms of sign language (Leroi-Gourhan, 1967; Pradel, 1975, though see Rouillon, 2006 for a counter argument). Finally, a recent study has shown that hand images appear to have been deliberately placed in association with specific characteristics of the walls or geological features indicating that the topography of the cave walls may have been important in making these images meaningful to contemporary populations (Pettitt et al., 2014).

Ethnographic accounts, however, suggest that hand images were produced within hunter-gatherer societies in the context of a range of different activities. Using the Australian Aboriginal literature, Moore (1979) notes that hand images were made for the purposes of memorialisation of a person or a visit, to mark the number and direction of persons passing a place, as the signature of an artist, as a form of message to spirit ancestors and so on. Gunn (2006), also reviewing the Australian literature, adds that hand

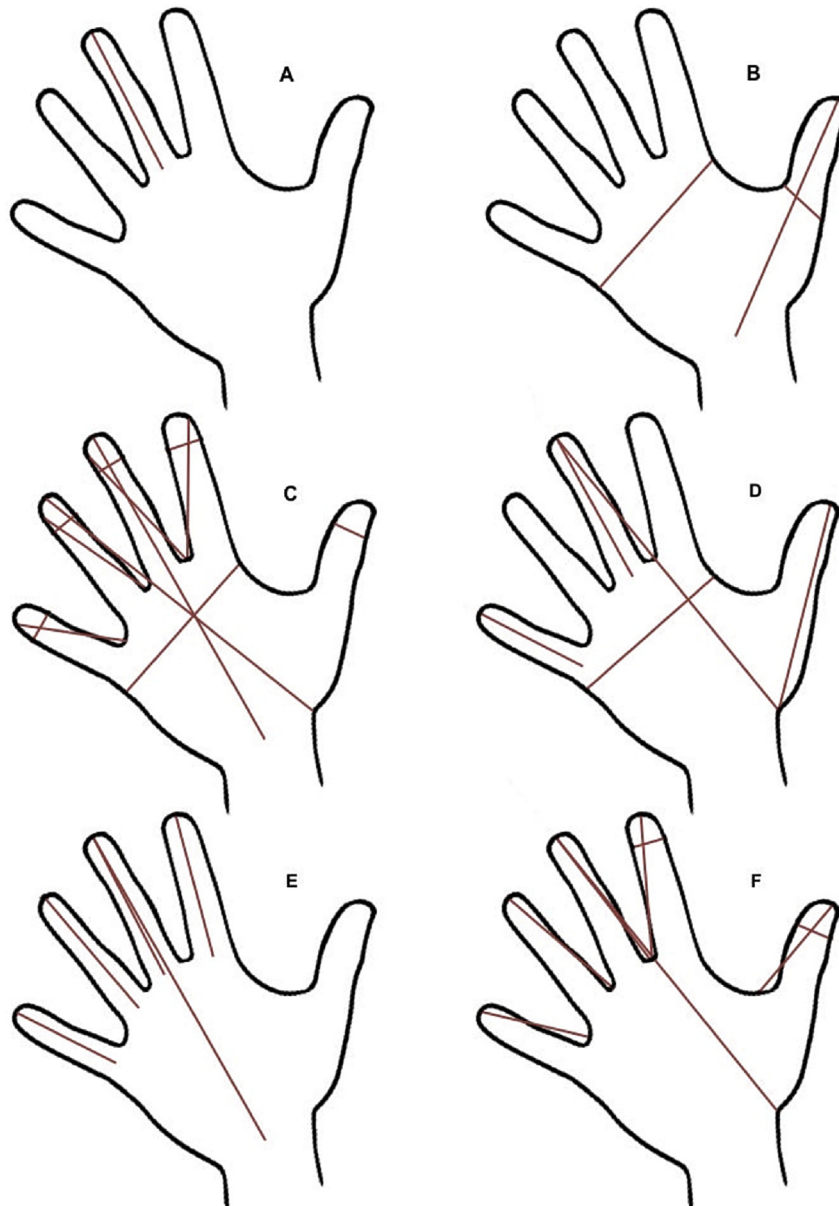


Fig. 1. Size dimensions used in previous studies (also see Table 1); A) Flood, 1987; B) Groenen, 1988; C) Guthrie, 2005; D) Gunn, 2006; E) Snow, 2006, 2013; F) Mackie, 2015.

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